THE

AGRICULTURAL GAZETTE

OF

NEW SOUTH WALES.

VOL. LIV.

Issued by Direction of
THE HON. W. F. DUNN, M.L.A.,
Minister for Agriculture and Forests.

K. SYNNOTT
Editor.

By Authority:
SYDNEY: ALFRED HENRY PETTIFER, ACTING GOVERNMENT PRINTER.—1944

* 43297—A

The AGRICULTURAL GAZETTE OF NEW SOUTH WALES

The Agricultural Gazette.

January, 1943.

AGRICULTURAL HOLDINGS ACT TO BE PROCLAIMED.

A. W. S. MOODIE, Senior Agrostologist.

THE Agricultural Holdings Act, 1941, is to be proclaimed and will become operative in the near future. This Act deals with relationships between landlords, tenants, and sharefarmers, and it can only fulfil the functions for which it was designed if it is understood and interpreted correctly by interested parties. In some quarters there appears to be a tendency to emphasise the purely legal functions of the Act, and to ignore other aspects which are, at least, equally important.

Every person concerned, either directly or indirectly, with the application of this Act should realise that it represents something more than an attempt to regularise landlord-tenant relationships. It was designed, not merely to strengthen in a purely legal sense the positions of tenants and sharefarmers in their dealings with landlords, but to secure also the adoption of higher standards of husbandry. It is legislation of the type which does not so much aim to compel persons to do certain things, as to confer upon them certain rights and privileges should they desire to claim them.

There appears to be some danger that this aspect may be overlooked, and the existence of the Act ignored, because of the natural reluctance of most farmers to become parties to litigation. If landlords and tenants will combine, and realise that in the long run the Act will prove beneficial to the interests of both parties and to the community, it should be on rare occasions only that disputes will be taken to agricultural committees for decision. The fact that the Act defines clearly and precisely the rights of tenants, sharefarmers and landlords, should in itself tend to eliminate many causes for disputes.

The Main Purpose—Good Husbandry.

Reduced to simple issues the Act is an endeavour to secure for tenants and sharefarmers certain rights, the enjoyment of which will permit them to practice a high standard of husbandry, secure in the knowledge that upon quitting the farm at the termination of their tenancy, they will be entitled to compensation for certain improvements. It is only reasonable that the tenant should be accorded legal protection, insofar as items such as buildings and

fittings erected, hay, silage and farmyard manure conserved or soil fertility improved by his efforts, are concerned.

By providing for tenancies of a minimum period of two years, with a clear twelve months notice of intention to terminate the tenancy, and for compensation for disturbance of tenure, the Act will enable tenants to plan a long range farming programme of a constructive nature. Under the existing system the tenant does not, as a rule, attempt to follow a constructive policy of husbandry or farm improvement, because his tenure is insecure, and upon the termination of his tenancy, improvements created by him become the property of the landlord.

A Framework to be Built On.

It is important to realise that while conceding certain rights to the tenant and at the same time safeguarding the interests of landlords, the Act deals primarily with minimum requirements, and that much may be achieved by the contracting parties to tenancy and sharefarming contracts further improving the forms of agreement. Those responsible for designing the Agricultural Holdings Act did not envisage the development of a system under which, at the termination of every tenancy, there would be litigation regarding compensation for improvements and other items. Rather was it felt that by specifying certain rights to which it was felt tenants were entitled, landlords and tenants would respond by adopting more complete forms of agreement, covering technical matters which, to-day, are conspicuously absent from agreements. After the Act comes into operation it will be in the interests of both parties to see that agreements cover matters such as the cropping systems to be followed; the treatments to be given to grasslands; the use of fertilisers, etc.

An Opportunity That Must Be Used.

The Agricultural Holdings Act can achieve its purpose only if tenants and sharefarmers make use of those rights to which they are entitled. Vouchsafed considerable freedom of action in the implementation of farm policy, they may erect subdivision fences, lay down temporary and permanent pastures, use lime and fertilisers, grow green manure crops, and conserve hay, silage or farmyard manure without the consent of the landlord, secure in the knowledge that at the termination of tenancy they may recover compensation for the unexhausted value of such improvements. Landlords have expressed concern at what may appear to be a license to the tenant to carry out improvements of no special value. It must be remembered however, that in assessing the value of such improvements, factors such as the practical worth and the use enjoyed by the tenant during his tenancy will be taken into account.

During 1916 the Rural Tenants Improvements Act was passed, to be later incorporated in the Agricultural Lessees Relief Act. That it failed to achieve its principal objective was due mainly to the inertia of tenants. They will shortly be offered another opportunity of improving their standards of farming, and of enjoying the rewards of good husbandry.

The Outbreak of Swine Fever.

SWINE fever has broken out in the County of Cumberland, and the County has been declared a Swine Fever Quarantine Area. This means considerable restriction on the movement and trading in pigs. No pigs can move out of the County of Cumberland, and the only movement of pigs permitted within the County is of animals to a saleyard or abattoir area for immediate slaughter. Such pigs must be accompanied by a permit issued under the Stock Diseases Act by an Inspector of Stock or Government Veterinary Officer. The movement of store pigs or stud pigs within the County is prohibited.

Of all diseases which affect pigs, none is capable of causing more loss than swine fever. The disease is usually so rapidly fatal and spreads with such alarming rapidity that it is rightly feared among pig farmers as the most dangerous scourge to which their stock are liable. The disease is not communicable to human beings.

New South Wales has enjoyed fourteen years freedom from this serious disease of pigs, the last outbreak having occurred in 1927-28. An appeal is made to all pig owners, stock agents and others to co-operate with the Division of Animal Industry, Department of Agriculture, in the efforts now being made to control and stamp out the disease. Any sickness or mortality in pigs should be immediately reported to the nearest Inspector of Stock or District Veterinary Officer, or by telephone message to B06, Extension 508.

The Possible Influence of the Agricultural Holdings Act on Livestock Industries.

MAX HENRY, B.V.Sc., M.R.C.V.S., Chief, Division of Animal Industry.

INASMUCH as the basal idea underlying the Agricultural Holdings Act is the maintenance of soil fertility, it is obvious that the operations of the Act will have an effect on the livestock industries. Nevertheless, it may be opportune to consider in more detail the manner in which such influence will be exercised.

It must be admitted that a superficial reading of the preamble to the Act would not yield the interpretation herein set out, and that a closer study of the relative sections of the Act is necessary in order to comprehend its true meaning.

The Act will doubtless be referred to, in common parlance, as the "Tenants' Compensation Act." This function, however, is only part of its purpose. Tenant compensation and the other items mentioned in the preamble are all incidental to the maintenance of soil fertility. If the Act is carefully perused, it will be seen that, although many rights and privileges are conferred on the tenant share farmer, certain quite definite responsibilities are also placed on such farmers. Both the privileges and the responsibilities have been provided and expressed with one ultimate idea in view, *i.e.*, the maintenance of soil fertility.

Security of Tenure Will Mean Better Farming Methods.

Naturally the tendency of such an enactment is to secure greater stability and security to the tenant and share farmer because, in their case, the incentive of ownership—to keep farm lands in good condition—is lacking. The more secure the tenant feels himself the greater should be the urge to prevent deterioration of the soil, and therefore the Act is framed to provide such security. If this understanding of the meaning of the Agricultural Holdings Act is grasped it will be found to be, not only an Act protecting a class of farmers who required protection, but an Act dealing with a matter of outstanding importance to our national well-being, which is a far more important matter.

Better Feeding Will Be Encouraged.

From the livestock angle, the mere fact of increased security of tenure must, in itself, react favourably, as the tendency to overstock should be reduced because the occupier of the land will be more inclined to look for continuity in his means of livelihood, and be restrained from endeavouring to wrench every penny out of the ground in the immediate present. It should also have an influence on the production and storage of fodder, with obvious benefits to the livestock. Fodder conservation will be encouraged also by the operations of section 29 of the Act, which provide to the tenant, legal rights of compensation for all hay, silage, straw and roots stored on the holding at the date of quitting the holding. Properly applied, by the farming community, this section should encourage the feeding of livestock and should tend towards providing the incoming tenant with a certain quantity of readily available feed.

Provisions Relating to Manures and Fertilisers.

If it is asked in what way this tendency will influence soil fertility, it may be pointed out that the better the stock are fed, the higher the value of the manure, and that nothing exceeds animal manure and urine in maintaining soil fertility.

In other sections of the Act, this manure factor is dealt with. In the section (29) already referred to the outgoing tenant is given right of compensation for manure or compost stored on the farm on the date of his quitting the holding. This is probably a somewhat new idea in Australian agricultural practice, but has long been a recognised principle in countries where soil conservation is looked at from the correct angle. The same line of thought is evidenced by the definition of "manuring" under the Act. This includes, not only the application of manures purchased for application to the land, but manurial value of feeds purchased and fed and of grain produced and fed on the holding.

Other "Rules of Good Husbandry."

The "rules of good husbandry" as defined by the Act also include items which must rebound to the benefit of livestock; in particular that relating to the adoption of farming methods to mitigate and prevent soil erosion. Soil erosion and its attendant evils of low fertility, denudation of pasture lands, decrease in water absorbing power of the soil and intensification of the results of drought, seriously affect the well-being of livestock.

Amongst other less outstanding matters which will have a beneficial result to livestock and which are referred to in the Act are water supplies, trees, which provide shelter so often lacking at present, and buildings.

Properly administered, with due regard to the basal idea of the maintenance of soil fertility, this Act may have far-reaching effects on the well-being of our livestock, and consequently on the economic condition of the most important group of industries in the country.


The Chemical Composition Of Pasture

AS RELATED TO ANIMAL NUTRITION.

(*Concluded from Vol.* 53, *page* 314.)

A. W. MILES, B.Sc., A.S.T.C., Chemists' Branch.

VARIATION in the composition and feeding value of natural pastures is due to the effect on the pasture of a number of factors, such as the balance of species present, the soil and climatic conditions, and the stage of growth at which the pasture is grazed. The first and last of these factors can be, to a large extent, controlled, and with a knowledge of their effects the stockowner can apply measures to increase the feeding value, and hence the carrying capacity, of his pastures.

Effect of Maturity.

One of the most important factors influencing the composition of pasture plants is their stage of growth. When the plant is in a short, immature condition, it usually contains the maximum amounts of protein and soluble ash, but as it matures the percentages of these constituents drop rapidly, whilst fibre and carbohydrates tend to increase. The following tables show the changes occurring in a typical perennial grass, *Phalaris tuberosa,* and an annual grass (oats). Although oats is not sown as a pasture species, it is commonly used for grazing and is typical of many annual grasses.

TABLE 10.—Percentage Composition of the dried herbage of *Phalaris tuberosa* at Various Stages of Growth.*

Growth Stage.	Protein.	Fibre.	Carbo-hydrate.	Fat.	Soluble Ash.
	per cent.	per cent.	per cent.	per cent.	per cent.
Early tillering	33·00	15·88	34·65	2·26	12·37
Advanced tillering ...	15·97	20·13	47·12	3·00	11·62
Heading ...	7·94	25·96	52·93	1·80	8·86
Post-flowering	5·06	27·32	55·42	1·78	5·91
Maturity ...	3·37	26·71	57·75	2·12	6·59

***Richardson, Trumble, and Shapter; C.S.I.R. Bulletin 66.**

TABLE 11.—Percentage Composition ofOats (moisture-free herbage) at Different Stages of Growth.†

Growth Stage.	Height.	Protein.	Carbo-hydrate.	Fibre.	Fat.	Ash.	Lime.	Phosphoric Acid.
	in.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
Young ...	7–8	20·0	50·8	14·5	3·0	11·7	0·55	0·77
Young ...	12–13	10·8	57·4	18·5	4·1	9·3	0·42	0·35
Young ...	21–22	9·1	59·2	20·5	2·8	8·4	0·38	0·33
Young ...	27–28	8·3	54·7	26·4	3·0	7·5	0·31	0·33
Flowering ...	36–38	6·9	53·7	29·7	3·0	6·7	0·30	0·26
Immature grain	...	7·7	52·9	29·7	2·9	6·8	0·28	0·30

† Sotala; *J. Agric. Res.*, vol. 54 (1937), p. 399.

TABLE 12.—Average Composition of Lucerne (moisture-free herbage) at Different Stages of maturity.‡

Stage of Development.	Protein.	Fat.	Fibre.	Carbo-hydrate.	Ash.
	per cent.	per cent.	per cent.	per cent.	per cent.
Before bloom ...	19·0	2·7	22·3	36·6	9·8
1/10 to 1/2 bloom ...	14·9	1·7	30·1	35·0	8·9
1/2 to full bloom	14·0	2·0	30·3	35·8	8·3
Past bloom ...	12·8	2·1	31·9	36·1	7·5

‡ Morrison: "Feeds and Feeding."

The most important changes which occur with advancing maturity are, as can be seen in the accompanying tables Nos. 10 and 11, in the protein, fibre and ash contents, and in the lime and phosphoric acid contained in the ash. The young plant may contain from about three (in oats) to ten (in *Phalaris*) times the amount of protein as the mature plant, about twice the ash, up to

two or three times the amount of lime and phosphoric acid, but only about half the amount of fibre.

Legumes show the same changes in composition with maturity as do the grasses, but the decrease in protein and ash and the increase in fibre are not generally as large as in the grasses. This may be seen in Table 12.

Table 13 shows the average percentage composition of lucerne cut at various stages of growth, at Trangie and Cowra Experiment Farms. The analyses were made by Messrs. E. Griffiths and A. A. Ramsay.

As pasture plants, both legumes and grasses, reach maturity the proportion of leaf in relation to stem falls. Now since the stem contains less protein and more fibre than the leaf, the mature plants, with a higher proportion of stem, contain less protein and more fibre than the young plants. The increased feeding value of the latter is partly due to their leafiness, and, in fact, a good idea of the feeding value of a pasture can be gained from its appearance.

TABLE 13.—Average Percentage Composition of Lucerne.

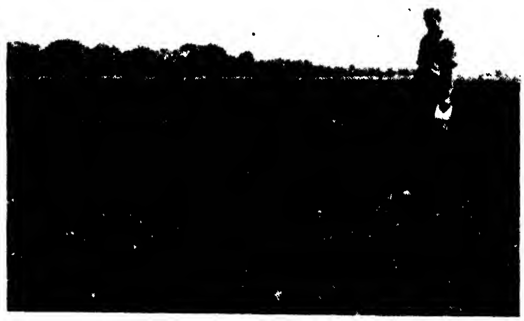
	Cut when 6 inches high.	Cut in bud stage.	Cut when in full flower.
Crude protein ...	25·96	25·65	19·37
Ether Extract ...	3·88	3·68	3·84
Fibre	13·91	14·77	19·59
Ash	14·82	13·84	12·36
Nitrogen-free extract	41·43	42·06	44·84
	100·00	100·00	100·00

Effects of Species.

In the grasses, differences in composition between one kind of grass and another are much less important than differences between a mature and immature grass of the same species. Frequently the differences found are mainly due to the degree of leafiness of the species; for instance, we would expect a typically leafy grass such as Perennial Rye (*Lolium perenne*) to contain more protein and less fibre than a stemmy grass, such as Tussocky Poa (*Poa caespitosa*). That this actually is the case may be seen in Table 14. The pasture plants listed in this table were grown on medium quality, heavy brown soil at Glen Innes, the grasses being analysed at the 5-7 inch stage of growth, and the legumes at a comparable stage of maturity.

Although the differences in composition between individual grasses grown under the same conditions are not large, the grasses, as a group, vary widely from the legumes, as may be seen from Table 14.

The protein and lime contents of the legumes are higher than in the grasses, and the crude fibre tends to be lower. This difference would be magnified with more mature plants, for, as has been pointed out before, the protein in grasses falls rapidly with maturity, but only slowly in legumes. Thus legumes have generally a higher feeding value than the grasses, and the effect of increasing the proportion of legumes in the pasture is to increase the feeding value.



Lucerne at Trangie.
At a stage of growth suitable for grazing by sheep.

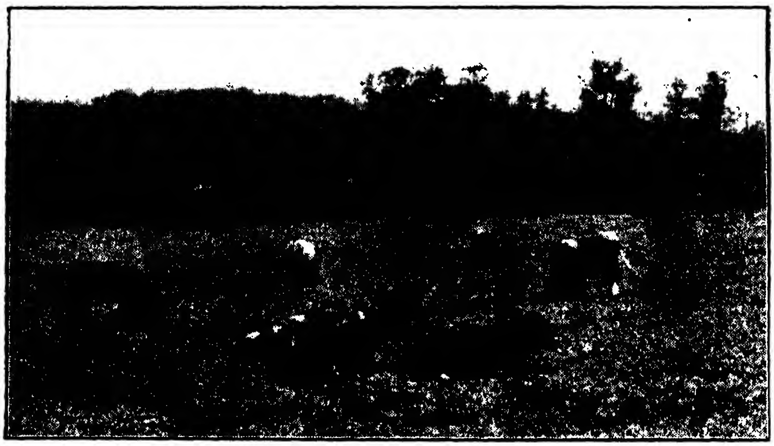
TABLE 14.—Variation in Composition between Species Grown Under the Same Conditions (Analysis C. E. Ahrens).

Species.	Protein.	Fibre.	Carbohydrate.	Ash.	Fat.	Lime.	Phosphoric Acid.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Grasses.							
Phalaris tuberosa (Toowoomba Canary grass)	12·3	12·8	56·2	14·7	4·0	0·44	0·80
Lolium perenne (Perennial Rye grass)	17·0	10·6	55·7	12·3	4·4	0·54	0·63
Poa caespitosa (Tussocky Poa)...	14·6	26·5	46·1	10·3	2·5	0·34	0·72
Dactylis glomerata (Cocksfoot) ...	18·2	17·1	46·6	13·0	5·1	0·52	0·61
Lolium italicum (Italian Rye grass)	15·6	12·3	59·2	9·3	3·7	0·56	0·86
Festuca elatior Tall Fescue) ...	15·8	19·9	50·4	9·9	4·0	0·38	0·82
Legumes.							
Trifolium pratense (Red Clover) ...	23·1	8·9	49·9	11·6	6·4	3·29	0·56
Trifolium repens (White clover) ...	27·7	9·4	46·4	11·9	4·7	2·13	1·00
Medicago lupulina (a trefoil) ...	23·7	13·0	44·9	13·5	4·7	1·98	0·75

Effects of Soil and Climate.

Climate influences the chemical composition of pasture only indirectly, for whilst there is a big seasonal variation in the chemical composition in a pasture sward, this is due to the facts that the balance of legumes with grasses varies throughout the year, and that the various species in the pasture commence growth and mature according to a definite climatic cycle. High fertility soils support a more nutritious pasture than those less fertile, for the pasture, being well supplied with nitrogen and readily available lime and phosphoric acid, will usually be high in protein and the minerals mentioned. Clovers are also usually more abundant in these better class soils.

Where soils are very deficient in certain minerals essential for animals, these deficiencies will be shown in the pasture, and nutritional disorders will occur in the grazing animal. The most common of these are the disorders due to a deficiency of lime and phosphoric acid. These have already been referred to in a previous section of this article.



Contented Animals on Young Growth of Paspalum and White Clover at the Training Farm for Boys at Berry.

Young pasture adequately top-dressed builds up growing animals.

These areas have been regularly top-dressed with lime and superphosphate.

Practical Implications.

From the above discussion of some of the factors influencing pasture composition, it becomes clear that the feeding value of natural pasture can be increased by increasing the proportion of legumes in the pasture, by increasing the fertility of the soil, and by ensuring that the pasture is grazed at an immature stage of growth. The first two methods are related, for where the fertility of the soil is increased, legumes tend to become more abundant.

The most widely applicable means of accomplishing increased feeding value of natural pasture is by top-dressing with superphosphate. The majority of the soils on the coast and tablelands are low in phosphoric acid, and where this deficiency is made up by the application of superphosphate (with, where necessary, lime or dolomite), the naturally occurring legumes become more abundant in the pastures, thus increasing its quality.

The third method, that is, grazing the pasture at an immature stage of growth is not as simple as the other two, as it immediately raises questions of whether the yield will be adversely affected, whether valuable grasses will persist, whether soil fertility will be depleted, and so on. In the case of herbage such as burr clovers, crowfoot, etc., the growth in good seasons is so rapid that it would be impossible, on large areas, to keep it in the short or immature stage.

However, with native grasses the system of frequent rotational grazing provides a satisfactory solution to some of these problems. The following is a very small portion of the data which has been collected by experiments in various parts of the world and which leads to this conclusion.

Four possible systems of grazing are:—Close continuous grazing, frequent rotational grazing, light continuous grazing, and infrequent rotational grazing.

Close continuous grazing (or overstocking) is the common practice over large areas of Australian sheep country. Whilst the feeding value of the young growth on this type of pasture is high the method is unsatisfactory in other respects and has been condemned by other writers than the author. Briefly, the disadvantages of this method of pasture management are that since the young shoots are eaten off as they appear, the perennial species are weakened and tend to disappear, to the advantage of quick-growing annuals which mature and die off, leaving the pasture relatively bare at certain periods of the year; more palatable species are eaten off more rapidly than weeds, this since there is never a sufficiently heavy concentration of stock to graze down the whole pasture; the patches of valuable species tend to disappear altogether and leave bare earth, which is then frequently subject to erosion.

Continuous light grazing is only applicable in the more arid pastoral areas; it has the disadvantage, compared with any rotational system, that the grazing is likely to be selective, coupled with the further disadvantage that the more mature plants in the pasture are likely to have a low feeding value.

Having eliminated both of the continuous grazing systems, we are left to compare frequent rotational grazing with infrequent rotational grazing.

Young immature pasture has a high feeding value. It also makes lower demands on the soil moisture. On the other hand, more mature pasture, having a greater leaf surface for absorption of sunlight and the carbon dioxide in the air, tends to produce a greater weight of herbage per acre than the immature pasture, providing that there is an adequacy of soil moisture and providing also that other conditions are the same. However, under frequent grazing conditions there is a more rapid return to the soil of fertilising constituents in the droppings. This may increase the productivity of the pasture to the same as, or more than the less frequently grazed pasture.

These points are well shown in Tables 15 and 16. In Table 15, where a grass (*Phalaris tuberosa*) was grown in sand culture, and the herbage cut and removed, there is a steady drop in total dry weight of the herbage as the cutting becomes more frequent. In Table 16, however, where the pasture is grazed instead of being cut, the two-monthly grazing gives a higher yield than hay and aftermath, and in the case of the old pasture where fertility had been improved by four years of close rotational grazing, the weekly grazing gave the highest yield.

TABLE 15. The Effect of Frequency of Cutting upon the Yield and Composition of *Phalaris tuberosa*.§

	Number of cuts.			
	1	2	3	5
Yield of herbage ..	100	81	63	46
Mean percentage of nitrogen	0·54	1·39	2·12	3·58
Mean percentage of phosphoric acid	0·28	0·56	0·67	0·81
Yield of nitrogen .	100	207	248	303
Yield of phosphoric acid ..	100	163	152	132

§ Richardson, Trumble and Shapter: C.S.I.R. Bulletin No. 66 1932.

Another important point shown by Table 15 is that although the yield of the frequently cut *Phalaris* was only 46 per cent. of the yield from the pot which was cut only once, yet the amount of nitrogen in the former was sufficient to raise the yield of *nitrogen* to three times that from the latter treatment.

Consideration of this point shows why, in spite of reduced yield of total herbage, closely grazed pastures may have a higher carrying capacity, for although the total herbage produced may be lower than in a light rotational grazing, the yield of valuable nutrients is likely to be higher and the digestibility is usually higher, so that the net effect is a much higher return of digestible nutrients per acre. As has been pointed out in the second section of this article, it is the yield of digestible nutrients which determines how many animals may be carried to the acre.

TABLE 16.—Yields of Herbage from Pastures Under Different Systems of Management.

	Long established sward after four years' treatment.	Young legumes after two years' treatment.
Som of herbage from hay aftermath	100	100
Som of herbage from two-monthly cuts · herbage allowed to rot back ...	100	131
Som of herbage from two monthly cuts · herbage removed . ..	80	119
Yield from two monthly grazing	120	133
Yield from weekly grazing	140	118

Stapledon; Welsh Plant Breeding Station Bull. 15, 1939.

Frequent rotational grazing, then, is practicable; it is likely to give an increased weight of herbage which will contain a greater proportion of valuable nutrients of higher digestibility, resulting in a greater carrying capacity with the same class of livestock, or a possibility of improving the class of livestock carried; it is economical of soil moisture; productive of soil fertility; and, where intelligently used, with a rest of the pasture at a time suitable for re-seeding of valuable annuals, or for the "shooting" of perennials, it can be used to encourage the valuable species in the sward.

Detailed recommendations covering rotational grazing and other management requirements of pastures in different areas of the State are available from the Chief Agrostologist of the Department; they are based on experiments carried out in locations typical of the districts concerned. However, within the scope of these district recommendations, each farm will show variations and should be treated individually. With a knowledge of the factors involved, the stockowner, who is in a position to see the week-to-week changes in his pastures, can do much to increase the feeding value and carrying capacity of the sward.

A Sale of Hawkesbury College Jerseys.

THE first sale of stud Jersey cattle ever to be held at Hawkesbury Agricultural College is to take place at 1 p.m. on Wednesday, 10th February. The sale will provide an opportunity for breeders to obtain animals from one of the most famous studs in the world. The herd is certified as tubercle-free and contagious abortion free.

Approximately fifty head of pedigree animals, comprising bulls, cows and heifers, will be offered.

Prospective buyers should travel by train leaving Central Station at 9 a.m. and alight at East Richmond Railway Station, whence conveyances will transport them to the College. Basket luncheon will be provided.

Approved Seed.

January, 1943.

To assist in the production and distribution of approved seed of recommended varieties of crops and vegetables, the Department publishes in this list each month the names and addresses of growers of such seed. For this service a charge of 2s. 6d. is made for each insertion of each variety listed. The number of varieties listed on behalf of each grower will be restricted to twenty-five for the time being. The Department may inspect the crop producing the seed, and in all cases a sample of the seed must be sent to the Department of Agriculture with information as to the location of its production, and must be accompanied by the fee indicated above.

If any seed producer does not wish to pay the advertising charge he may submit his name with the variety of seed and sample to the Department, and if it is approved his name will be listed in the Department and information will be supplied regarding it to inquirers.

Cauliflowers.

Hawkesbury Solid White—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Phenomenal Five Months—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Tomatoes.

Marvana — Rumseys Seeds Pty. Ltd., 331 Church-street, Parramatta.

Australian Earliana—Rumseys Seeds Pty. Ltd., 331 Church-street, Parramatta.

Rouge de Marmande—Rumseys Seeds Pty. Ltd., 331 Church-street, Parramatta.

Red Marhio No. 95—Rumseys Seeds Pty. Ltd., 331 Church-street, Parramatta.

Varieties of Approved Seed Available.

IN order that farmers may be directed to what are regarded by the Department as the most satisfactory local sources of approved seed of recommended commercial varieties of farm crops and vegetables, the Department is willing to supply information concerning such sources of seed of the following varieties:—

Cauliflowers—

Hawkesbury Solid White, Nugget, Shorts.

Onions—

Hunter River White.

Pumpkins—

Queensland Blue.

Grasses, etc.—

Phalaris tuberosa, Subterranean Clover (mid-season), Sheep's Burnet, Lucerne.

Official Recordings of the Department's Herds.

273 Days' recording completed during November, 1942.

Cow.	Sire.	Owner.	Age at beginning of test. yrs. mths.	Milk. lb.	Average test. per cent.	Butter fat. lb.
		Australian Illawarra Shorthorn.				
Mature Cows—						
Fairholm Dairymaid 4th ...	Fairfield Royal	Grafton Experiment Farm ..	7 11	8,050½	3·5	280·17
Coral Grange Queen 19th ...	Guardsman of Fairfield ...	" " ...	6 0	8,028	3·3	262·22
Logie Bank Rascal 3rd ...	Logie Bank Bonnie Boy ...	" " ...	7 4	5,770½	3·6	206·35
Junior 4 years—						
Fairholm Molly 4th ...	Raleigh Sunray	" " ...	4 4	8,914½	3·7	332·75
Junior 3 years—						
Upton Pigeon 47th ...	Greyleigh Feldspar ...	" " ...	3 2	4,122	3·5	144·67
		Guernsey.				
Junior 3 years—						
Wollongbar Kitty	Wonderful Standard of Les Pieces Lodge.	Wollongbar Experiment Farm.	3 5	5,869½	5·0	292·97
Junior 2 years—						
Wollongbar Bright Eye ...	Wollongbar Wonderful Standard.	" " ...	2 4	5,976	5·2	312·63
		Jersey.				
Mature Cow—						
Yanco Minnie 5th	Yanco Sandman	Riverina Welfare Farm ...	9 5	6,597	5·1	336·31
Senior 4 years—						
Wagga Gentle 2nd ...	Wagga Comfort's Heir ...	Wagga Experiment Farm ...	4 7	5,345½	4·9	264·45

NOTES CONTRIBUTED

BY THE BIOLOGICAL BRANCH.

INOCULATION OF LEGUME SEED.

R. J. Swaby, M.Agr.Sc., B.Sc., Assistant Bacteriologist.

ALL plants require nitrogenous substances for the formation of their proteins. Non-legume crops, such as cereals, pasture grasses, fruits and many vegetables, are entirely dependent on soil nitrogen compounds either derived from humus or applied as expensive artificial fertilizers like sulphate of ammonia and nitrate of soda. On the other hand legumes, for example, clovers, lucerne, peas, beans and cowpeas, are not necessarily dependent on soil nitrogen because they can obtain it from the air. Legumes are unique in their ability to utilise atmospheric nitrogen and it is because of this feature that they are such valuable green manure, fodder and crop plants.

Legumes and Root Nodule Bacteria.

The actual extraction or fixation of nitrogen is brought about by beneficial germs or bacteria, living inside nodules produced on the roots of the legume. Nodules on different legumes vary greatly in shape and size. Figs. 1 and 2 illustrate the nodules found on soybeans and red clover. True root nodules should not be confused with the nodular growth of roots infected by injurious eelworm (or nematode) parasites (*see* Fig. 3). The relationship between the legume and the root nodule bacteria is one of mutual benefit, the plant host supplying sugary foods to the bacterial guest in exchange for nitrogenous compounds.

When nodule bacteria are present in a soil they invade the roots of the legume seedling and produce minute nodules which become visible to the naked eye about one month after germination. As the plant continues to grow the nodules increase in number and size, reaching a maximum just prior to flowering when the demands for nitrogen are greatest. After flowering and setting of seed the nodules start to decay, the bacteria being released into the soil, remaining there until the next season, when they infect the following legume crop.

Unless the root-nodule organisms are present, nodules cannot form and assist the legume, which then behaves as an ordinary plant, "mining" or exploiting the meagre supply of soil nitrogen. In order to ensure nodulation it is wise to add the bacteria artificially at the time of sowing the crop.

Artificial Inoculation.

The simple process of mixing a bacterial preparation with legume seeds before planting is called artificial inoculation. A bacteriologist first obtains bacteria from the nodules of a flourishing legume crop and cultivates them as a slime on a nutritious jelly, thereby producing a culture. Cultures containing millions of living root nodule bacteria are despatched to farmers in small bottles plugged with cotton wool (see Fig. 4). This porous plug permits aeration without allowing moulds to enter and spoil the culture. It should not be removed until everything is ready for inoculation.

To carry out inoculation, the legume seed is first spread on a flat surface such as a sheet of iron or floor of a shed. It is then sprinkled with a mixture made by shaking the bacterial slime with a little water. The seed is mixed with a shovel or by hand, so that each is covered with a film of moisture; this is soon absorbed by the seed coat, leaving the bacteria sticking to the surface, and within an hour the legumes can be sown. Inoculated seed should not be exposed to bright sunlight because the root nodule organisms are killed.

Fig. 1.
Root Nodules on Soybean.

This bacterial treatment is quite harmless to the operator and does not affect the rate of running of seed through the drill. Soon after germination the micro-organisms enter the young root tips, produce nodules, and immediately start fixing atmospheric nitrogen.

Groups of Root Nodule Bacteria.

Many legumes require entirely different root nodule bacteria; consequently, the principal leguminous crops are classified according to the seven groups of bacteria concerned with nodule formation. These groups include the following plants:—

1. *Lucerne Group.*—Lucerne, Burr trefoil, Barrel clover, Button clover, Yellow sweet clover, Bokhara or White sweet clover, Fenugreek and all other species of *Medicago* and *Melilotus.*
2. *Clover Group.*—Subterranean clover, white clover, Red clover, Egyptian or Berseem clover, Alsike clover, Ball clover, and all other species of *Trifolium* (the true clovers).
3. *Pea Group.*—Vegetable pea, field pea, sweet pea, Tangier pea, common vetch, purple vetch, golden tare, broad bean, lentil, and all other true peas, vetches and tares.
4. *Cowpea Group.*—Cowpea, partridge pea, velvet bean, lima bean, peanut, kudzu vine, Japanese clovers or lespedezias, sunn hemp and many native legumes such as wild indigo, broom, gorse and all wattles.
5. *Bean Group.*—French bean, navy bean, kidney bean, scarlett runner bean and all other true beans.
6. *Lupin Group.*—New Zealand and West Australian blue lupins, yellow or field lupin, garden lupins.
7. *Soybean Group.*—Soybeans.

Fig. 2.
Root Nodules on Red Clover.
[*After Edwards and Barlow.*

Fig. 3.
Root Nodules caused by Eelworms on Cowpea.

Bacteria from one group are useless on legumes from other groups; for example, clover bacteria only benefit clovers and will not nodulate lucerne, lupins, soybeans, etc. Similarly peas and beans cannot be expected to form nodules, merely because the land previously supported a good growth of clovers and burr trefoil. Within each bacterial group it is possible to get different strains of bacteria—some efficient nitrogen fixers, and others inefficient and therefore practically useless to a legume. The bacteriologist must test all cultures, selecting only those strains which fix large amounts of atmospheric nitrogen, for despatch to the farmer.

Cost of Inoculation.

Tested cultures suitable for each of the above groups may be obtained on application to the Chief Biologist, Department of Agriculture, Box 36A, G.P.O., Sydney.

A charge of 2s. 6d. (post free) is made for each culture, which is sufficient to inoculate up to 30 lb. of small seed like lucerne and clovers, and 60 lb. of large seed like peas, beans, cowpeas and soybeans. Remittances should be made payable to the Under Secretary and Director, Department of Agriculture, and should be forwarded with the order for cultures. The present nominal charge for cultures is possible only on a cash sales basis, thereby obviating book entries and subsequent correspondence. Cultures take several days to prepare, so it is advisable to order them a week before it is desired to use them. Always state the name of the crop and the amount of seed to be sown.

The cost of inoculation is small, being one halfpenny per lb. of large seeded legumes and one penny per lb. of small seeded types. The extra work involved is almost negligible and is amply repaid by the increase in crop yield.

Fresh cultures, as sent out by the Department, contain sufficient slime to cover each legume seed with about 1,000 bacteria. It is advisable to use the culture within one month of receiving them because the bacteria gradually die off after this period.

The Necessity for Superphosphate and Lime.

The maximum benefits of inoculation will not be experienced unless adequate supplies of superphosphate and lime are present in the soil. In general the phosphate and lime requirements of a legume crop are two or three times those of non-legumes.

Australian soils are deficient in phosphates and no legume crop should be planted without superphosphate. As a guide to the amounts of superphosphate required by various legumes growing in different parts of the State, Table 1 has been prepared after consulting crop specialists in the Department.

TABLE 1.—SUPERPHOSPHATE REQUIREMENTS PER ACRE.

Crop.	Coast.	Tablelands.	Western Slopes.	Western Plains.
	cwt.	cwt.	cwt.	cwt.
Lucerne	2	1 1½	1–1½	1 (Better rainfall areas). 1½–2 (Irrigation).
Clovers (in pastures)	1½-2	1–1½	1	1 (Every 2nd year).
Peas	3–4	2	2	...
Field peas	2	1½	1	...
Tick beans	2	1½	1 (Dry farming), 2 (Irrigation).	...
Vetches	1½	1	1 (Dry farming), 1½ (Irrigation).	...
Cowpeas	2	1	...	...
Beans	4–5	2–3	2–3	...
Lupins	...	1–2	1–2	...
Soybeans	2	1–2	...	...

Many soils of New South Wales are strongly acid (more acid than pH6); they contain only sufficient lime to produce poor to fair legume crops, and maximum yields can be obtained only after applying lime, either in the form of finely-ground carbonate of lime, slaked lime, or dolomite. On the acid soils of the coast and tablelands it will be found advantageous to apply an initial dressing of 1 to 2 tons of lime per acre,

Fig 4.
Culture of Legume Bacteria.

followed by ½ ton every second or third year. The acid soils of the western slopes require an initial application of 1 ton and subsequent dressings of ½ ton every third or fourth year. The soils of the western plains are often acid, but it rarely pays to lime them except under irrigation, when 2 tons per acre should be applied. Dolomite,

Fig. 5.

Effect of Inoculation on Young Lucerne Growing in Soil from Hawkesbury Agricultural College.

Left.—Uninoclated.
Right.—Inoculated.

Fig. 6.
Effect of Inoculation on Young Pea Plants.
Left—Uninoculated. *Right*—Inoculated.
[*After Fred, Whiting and Hastings*

which contains both lime and magnesium, is preferable on the magnesium-deficient red loam areas of the "Big Scrub," Tweed River, Dorrigo-Comboyne Plateau and East Robertson Plateau.

Artificial inoculation is not a "cure-all"; it replaces the use of nitrogenous fertilizers, but it cannot replace the use of adequate amounts of superphosphate and lime. It is desirable to broadcast lime a month or two prior to sowing, so that it has time to neutralize soil acids.

Sow inoculated seed and superphosphate from separate boxes on the drill so that the bacteria are not killed by the acid in the superphosphate. If this is impossible, then add an equal weight of lime to the superphosphate a day before mixing the fertilizer with the inoculated seed.

Root Nodule Bacteria in the Soil.

The occurrence of root nodule bacteria in a particular soil depends mainly on whether legumes have grown there previously. A bacteriological survey of sixteen soils from different parts of this State was made with the aim of finding the number of groups of nodule bacteria present. None of the soils contained all seven groups of root nodule bacteria. Most of the soils showed the presence of lucerne and clover bacteria, half of them contained pea and cowpea bacteria, while very few gave evidence of bean, lupin and soybean micro-organisms.

Virgin soils recently cleared of scrub rarely contain root nodule bacteria because the native legumes of Australia are not plentiful, and possess only bacteria belonging to the pea and cowpea groups. Many cultivated soils contain only the bacteria associated with the more important legume crops grown in the district. This is the case in many of the wheat areas, where each year Burr trefoil and Subterranean clover are naturally inoculated with micro-organisms remaining in the soil from the previous season. Similarly in old-established lucerne and market garden areas it is rarely necessary to inoculate lucerne or leguminous vegetables like peas and beans. Where, however, a period elapses before the replanting of a legume, it is advisable to inoculate with the appropriate bacteria which may not have survived.

If a new legume crop is introduced into a district, it is essential to inoculate the seed before planting. The purpose of a legume as a green-manure or fodder crop, capable of enriching soil nitrogen, is defeated unless nodulation occurs. If proper bacteria are not definitely known to be present, it is better to presume their absence, and to safeguard failure of the crop by artificial inoculation.

Value of Inoculation.

Inoculation does not influence seed germination, but about six weeks after planting inoculated plants appear greener and larger than the yellow, stunted nitrogen-starved uninoculated legumes (see Figs. 5 and 6). This increased vigour is maintained throughout the life of the crop, and is entirely due to the fixation of nitrogen by the root nodule bacteria. The marked difference between inoculated and uninoculated plants at matur-

Fig. No. 7.
Effect of Inoculation on Soybeans.
Left—Uninoculated. *Right*—Inoculated.

TABLE 2.—INFLUENCE OF INOCULATION ON LEGUME CROP YIELD.

Legume Crop.	Location.	Fertilisers Used.	Crop Yields. (Green Weight in cwt. per acre.)			Percentage Increase in Yield Due to Inoculation.
			Inoculated.	Uninoculated.	Difference.	
		cwt. per acre.	cwt. per acre.	cwt. per acre.	cwt. per acre.	
*Lucerne	Bluff Rock	None	158.4	39.6	118.8	300
*Lucerne	Bluff Rock	1½ superphosphate	172.8	57.6	115.2	200
Cowpea (var. New Era).	Sydney ...	4 superphosphate, 10 lime.	223.3	163.6	59.7	37
Garden Bean (var. Tweed Wonder).	Sydney ..	4 superphosphate, 10 lime.	190.8	164.2	26.6	16
New Zealand Blue Lupin.	Chatswood	2 superphosphate, 10 dolomite.	380.9	127.3	253.6	199
†Soybean (var. Easy Cook).	Glen Innes	2 superphosphate,	163.8	145.5	18.3	13
			18 bus.	12 bus.	6 bus.	
			40 lb. (seed).	32 lb. (seed).	8 lb.	49
†Soybean (var. Haberlandt).	Sydney ...	4 superphosphate, 10 lime.	185.9	109.0	76.9	71

* After Kerle, W. D. † After O'Reilly, J. A.

ity is illustrated by soybeans in Fig. 7. Inoculation not only increases the growth of clovers and lucerne for stock fodder, and cowpeas, tick beans and field peas for green manures, but it also increases the yield and grade of seed from soybeans, garden beans and peas. It is worth noting, however, that inoculation has no beneficial effects on non-legumes.

Each year hundreds of cultures are sold to farmers, who report most favourably on the benefit of inoculation. When using cultures the Department of Agriculture suggests that farmers should make a test by first sowing a drill width of uninoculated seed and afterwards planting the rest of the field with inoculated seed, so that the two treatments can be compared.

The Department of Agriculture has conducted numerous field experiments to test the value of inoculation; in most cases inoculated and uninoculated plots were compared merely by inspection, but in a few experiments crop yields were determined. The figures for some of these experiments are shown in Table 2.

Summary.

Legumes are the only plants capable of utilising atmospheric nitrogen, hence their great importance in agriculture. They can do so only in association with root-nodule bacteria.

Many soils lack adequate numbers of the proper bacteria for legume crops and these must be introduced by artificial inoculation of the seed.

The soil should contain adequate amounts of phosphate and lime to ensure the best conditions for nodulation and crop growth.

Areas which show the greatest response to inoculation include virgin soils, land planted for the first time with a new legume, areas where difficulty is experienced in establishing a crop, old wheat lands and soils exhausted of nitrogen by continuous cropping.

Considering the cheapness of inoculation, it is wise to treat all legume seed before planting.

The Excessive Uptake of Manganese by Beans showing Scald and Magnesium Deficiency.

ITS REGULATION BY LIMING.

N. H. PARBERY, D.Sc.Agr., Chemist's Branch.

THE first portion of this article summarises an investigation of the mineral composition of healthy, scalded and magnesium deficient bean crops. The latter part presents details of an experiment, designed in the light of information provided by the chemical data, in which scald was controlled in plants growing in pots of soil from affected districts by the use of lime and dolomite, whereas plants in untreated pots were scalded and sometimes defoliated. Moreover, the manganese content of plants grown on the limed soils was reduced to a normal level.

Widespread failure of dwarf French bean crops grown from seed saved on the farms, has occurred in the Wyong district, due to a condition known locally as "scald." Both spring and autumn crops are affected, and browning of the leaves, suppressed growth, defoliation and failure to set pods are common manifestations of the disease. The dark grey, fine sandy loams which comprise most of the soils of the Tumbi Umbi area where beans are grown, are, in the natural state, very acid and deficient in minerals, and fertiliser practice has been mainly concerned with the use of phosphatic and nitrogenous fertilisers.

A significant feature of bean scald is that seed raised on the more fertile and more highly mineral-saturated alluvial soils of the Maitland and Wellington districts, when sown on the acid soils, produces plants of vigorous growth and high productivity with unblemished leaves. Seed saved from these plants, however, and sown in the same soil in the succeeding season, produces plants which grow normally and at a similar rate to the plants from newly-introduced seed until the advent of unfavourable conditions such as a few days of westerly winds. The plants from the farm-saved seed are then severely scorched, and take on a bright brown, scalded appearance, whilst adjacent plots from introduced seed are little affected, except on occasion by heat scorch, which affects the leaves and produces a grey-green colour in the dried out tissue.

It is thus the common experience of the Wyong district growers that a single season's association with their soils predisposes the progeny of the best quality seed to scald.

The Mineral Composition of Beans.

Healthy and Scalded Plants.

The mineral composition of healthy beans grown from introduced seed, or from farm-saved seed in new soils, shows no evidence of a deficiency of any element. In contrast with the prevailing stress placed on the widespread deficiency of minor elements, scald in beans appears to be related to an excess of certain elements. The amounts of lime, magnesium, boron and potash present in healthy and scalded plants are similar, whereas phosphate and nitrogen values are significantly higher in the scalded plants. Iron also reaches the highest values in the scalded plants.

The most striking variation in composition between healthy and scalded plants lies in the excessive amounts of manganese contained in the latter. The crops immediate from seed grown on well-based soils take up relatively moderate amounts (120-220 parts manganese per million of dry plant material) of manganese from the acid soils of the Wyong district in their first season thereon. By general standards for legumes in New South Wales—subterranean clover (56 p.p.m. Mn.), field peas (37), red clover (33), soya beans (37), tick beans (50) and N.Z. lupins (40)—these values are, however, high, but they do not approach the high values, in excess of 600, found in the scalded beans.

Restricted growth and accompanying failure to utilise absorbed nitrogen leads to a high concentration of nitrate in scalded plants. High manganese content and excessive nitrate accumulation have also been found by the author to accompany scorch in peas and broad beans, and tip burn of the heart leaves of young cabbages and cauliflowers.

That scald is related to soil conditions is suggested by the accidental association of a healthy portion of an otherwise scalded crop of Hawkesbury Wonder with the ash of fired timber. The healthy portion of the crop contained only one-third of the amount of manganese present in the scalded portion of the crop.

In furtherance of this aspect of the problem, samples of farm-saved seed were grown in the writer's garden at Roseville, which in the recent forested state was a yellow sandy loam of high infertility and acidity, but which has been improved by the addition of organic matter, dolomite and complete fertilisers. The farm-saved seed of each of the varieties which, in the experience of the Wyong growers would have produced

scalded crops, produced in the Roseville soil, plants which were vigorous, productive and without scald symptoms. Further, these plants contained the low values of 30-55 p.p.m. of manganese. Extracts of the acid soil associated with high manganese uptake by beans, indicate that the manganese in these soils was mobilised in greater quantity than in soils not subject to scald.

Composition of Bean Seed.

The mineral constituents of bean seed from well-based soils were compared with those of seed saved from crops grown at Wyong, in order to examine the possibility of any unusual feature, particularly of deficiency, having a deleterious effect on ensuing crops. Manganese is present in the seed in small amount compared with the whole plant, but is present in slightly greater amount in the farm-saved seed.

Generally, however, the differences in composition of the seed are so slight that it can be claimed that samples of farm-saved seed giving rise to scalded plants show no evidence of deficiency or excess or any one of the contained minerals when compared with seed which would produce healthy crops.

Magnesium Deficiency.

When scalded crops at Tumbi Umbi were examined in May, 1940, certain plantings of beans were exhibiting symptoms of magnesium deficiency. The early symptoms of magnesium deficiency, which occur as evenly distributed yellowish-green blotches, were no longer apparent, and the affected plants, which bore practically no fruit, were whitish-yellow in appearance, the interveinal strips being almost white.

Magnesium deficient plants contain considerably smaller amounts of magnesium, lime and potash than apparently healthy plants in the same planting, and have a considerably higher content of manganese, phosphate and nitrogen. The manganese content of the chlorotic, manganese deficient plants is inordinately high, reaching in the extreme nearly 1,800 p.p.m. Mn, and is more than double that of the associated green plants, which also contain much manganese.

Effect on Manganese Uptake of Altering the Soil Reaction.

The effect on the incidence of scald and on the manganese content of bean plants, of altering the reaction of the soil was investigated. Three soils, A and B (sandy loams) and C (a heavy loam) from the properties respectively of Messrs. H. King and K. Earl, Berkeley Vale, and Mrs. Swadling, Wamberal, were used. They were liable to produce scalded crops when seed saved in these districts was sown. The natural acidity of the soils was reduced by the application of slaked lime or dolomite and intensified by the addition of sulphur.

Replicated treatments of each soil consisted of the addition of slaked lime at the rate of 3 tons, dolomite 4 tons and sulphur 600 lb. per acre 8 inches, separately, to 35 lb. of soil. After mixing, the soil was transferred to large earthenware pots on 9th October, 1941, wetted to field capacity and stored, with periodic wetting to enable the reactions within the soils to proceed.

Bean Fields in the Wyong District.

On 23rd March, 1942, the soil was disturbed sufficiently to allow the placement of an appropriate supply of a complete fertiliser consisting of superphosphate, sulphate of ammonia and sulphate of potash at a depth of 4 inches, and seed of beans grown in the Wyong district was sown. The pots were placed out-of-doors in a position exposed to full sunlight. During the course of the experiment strong westerly winds, such as induce scalding in susceptible field crops, were experienced for some days following 5th May.

Foliage Symptoms and Yields.

Certain symptoms exhibited by plants in some of the pots, as well as the average weight in grammes of pods harvested from pots within a particular treatment, are given in an accompanying table.

A scalded condition of the foliage identical with that found in the field occurred during the course of the experiment on two of the untreated soils, and on all treatments where soil acidity had been intensified by the addition of sulphur.

On the sandy loams manganese deficiency was temporarily induced by the slaked lime and

FOLIAGE Symptoms and Plot Yields.

Soil.	Treatment.	Foliage Symptoms. 30th April.	Foliage Symptoms. 7th May.	Foliage Symptoms. 30th May.	Yield of Pods per Pot.
					Grammes
A.	Untreated	Growth fair	Foliage scald ...	Largely defoliated ...	21
	Lime ...	Leaves pale; manganese deficiency.	No scald ...	Foliage normal green...	81
	Dolomite ...	Leaves pale; manganese deficiency.	No scald ...	Foliage normal green...	67
	Sulphur ...	Foliage scald since 6th April; dwarfed.	Severe foliage scald; buds shed.	Plants defoliated ...	5
B.	Untreated	Growth fair	Inner leaves scalded.	Largely defoliated ...	31
	Lime ...	Slight manganese deficiency...	No scald ..	Foliage normal green ...	74
	Dolomite	Slight manganese deficiency...	Very slight scald of edges.	Foliage normal green ...	70
	Sulphur ...	Poor growth	Severe scald ...	Largely defoliated ..	28
C.	Untreated	Plants healthy	No scald ...	Foliage normal ...	55
	Lime ...	Plants tall, healthy	No scald ...	Tall, foliage normal ...	90
	Dolomite ...	Plants tall, healthy	No scald ...	Tall, foliage normal ...	87
	Sulphur ...	Plants showing magnesium deficiency since 13th April.	Slight foliage scald.	Partial defoliation ..	40

dolomite treatments, but the foliage assumed a normal green colour before the plants flowered.

Acidification by sulphur of the heaviest soil did not induce any marked foliage scald, but apparently interfered with magnesium and probably lime absorption, since pronounced symptoms of magnesium deficiency developed. The absence of scalding in magnesium deficient plants containing excessive amounts of manganese was also a feature of field crops.

Considerable increases in the yield of green pods were obtained on the lime and dolomite treated plots.

Manganese and Iron Contents of Bean Plants and Soil Reaction at Harvest.

The manganese and iron contents of the whole plants, expressed as parts per million of dry tissue, as well as the reaction of the soil at harvest, are recorded in the following table:—

Soil.	Treatment.	Mn. p.p.m.	Fe. p.p.m.	pH.
A.	Untreated ...	207	1,683	4.6
	Lime ..	38	975	6.8
	Dolomite ..	45	1,200	6.5
	Sulphur ...	530	2,250	4.2
B.	Untreated ...	262	2 210	4.4
	Lime ...	36	862	6.6
	Dolomite ..	32	1,500	6.4
	Sulphur ...	291	2,305	4.1
C.	Untreated ...	780	975	4.6
	Lime	68	1,537	6.4
	Dolomite ...	66	1,387	6.1
	Sulphur ...	1,340	2,717	4.4

The manganese content of beans grown on the untreated soils is high, but intensification of acidity by treatment with sulphur causes a greatly increased uptake on this element. As in the field, the plants showing magnesium deficiency symptoms contain the highest amount of manganese. The lime and dolomite treatments very effectively regulated the uptake of manganese which in the plants from these treatments, was only a small fraction of that found in the plants on the untreated soils.

Reduction of acidity had much less effect on the uptake of iron than that of manganese. The uptake of iron was considerably greater in the pot experiments than in the field illustrating the mobility of iron, even at reactions approaching neutrality. The maintenance of a relatively high degree of water saturation of the soil and the absence of moisture fluctuations such as occur in the field, contributed to the mobility of iron. Only in the Wamberal soil was the uptake of iron in the untreated soil less than in the limed soils. Plants grown on the soils treated with sulphur contained the greatest amount of iron.

The Rectification of Mineral Unbalance.

The excessive uptake of manganese, iron and possibly aluminium by bean plants liable to scald, as well as chlorosis due to a deficiency of magnesium, are in effect, varied expressions of mineral depletion of soils, giving rise to excessive acidity. In the former case acidity has caused the mobilisation of manganese and iron in excess of the amounts required for good growth, whilst the continuous loss of magnesium has been partly responsible for the slow increase in soil acidity.

Lime and magnesium, when present in adequate though not excessive amounts, maintain a condition of soil stability which allows of balanced

plant nutrition in soils containing all the necessary elements. By their influence on the reaction of the soil they condition the absorption of certain elements liable, in some soils, to be absorbed in excessive quantity when the soils become very acid. Treatment of the soils with liming materials in the pot experiment has shown how effectively the uptake of manganese can be regulated to a level adequate for healthy growth.

The use of dolomite in combating soil acidity is preferable in an area where crops are liable to exhibit symptoms of magnesium deficiency. It provides lime and magnesium, as well as being practically as effective in reducing acidity as the more active forms of lime when used in chemically equivalent amount. Three pounds of slaked lime are equal in effect to about 4 lb. of dolomite.

At the present level of acidity and in the light of experience on neighbouring soils, 4 tons of dolomite per acre will be necessary to effect a satisfactory reduction of acidity. It has been found that orchard applications of 2 to 3 tons per acre affect only the depth of soil in which they are incorporated, and the soil below the layer remains as acid as formerly. The problem of soil acidity still remains if the dolomite is mixed in the surface few inches and the mass of the roots are still foraging in a strongly acid medium. Efficient application apparently requires either deep incorporation with a rotary hoe or applying half the required amount and cultivating before ploughing in deeply, when the remainder could be applied on the rough surface and cultivated into the surface few inches.

The application of liming materials is a long term investment and considerations of time and season of application are less important than securing the efficient placement of an adequate dressing. A crop following immediately on the application may not secure the benefits of a considerable reduction in acidity, but later crops should respond to improved soil conditions.

Control of Second-hand Fruit Cases.

THE Minister for Agriculture and Forests (the Hon. W. F. Dunn, M.L.A.) has announced that, following representations made by various organisations representing fruit and vegetable growers, and in view of the shortage of timber for new cases and manpower and transport difficulties, an Order has been issued by the Premier in pursuance of the powers conferred upon him by Regulation 35A of the National Security (General) Regulations under the National Security Act, 1939-40, to control the sale and use of second-hand fruit cases.

The Order provides—

"No person shall sell or supply any second-hand fruit case to any person who is not—

(*a*) a bona-fide fruitgrower or vegetable grower; or

(*b*) a second-hand case dealer who has registered his name and address under clause five of this Order,

except under and in accordance with a permit in writing issued by an officer of the Department of Agriculture authorised in that behalf by the Minister."

"No person shall—

(*a*) use any second-hand fruit case otherwise than for the purpose of containing fruit or vegetables; or

(*b*) damage or destroy any second-hand fruit case,

except under and in accordance with a permit in writing issued by an officer of the Department of Agriculture authorised in that behalf by the Minister."

Provision is also made that every second-hand case dealer shall register with the Minister for Agriculture his full name and the address of his place of business. The Minister is empowered to require second-hand case dealers to furnish such particulars as he may require.

The types of cases to be controlled are the Standard Bushel (with or without hinged lids), Apple Dump, Half Bushel Dump, Flat Half Bushel (with or without hinged lids), Quarter Bushel and Orange and Melon Crates.

Tropical cases are not covered by the Order and will, therefore, be available for general use as in the past.

Application for registration may be made in ordinary letter form and should be addressed to the Under-Secretary and Director, Department of Agriculture, Box 36A, G.P.O., Sydney.

Applications from country districts for permits to sell cases other than to fruit or vegetable growers or registered case dealers may be made either to the local Fruit Inspector or direct to the Department.

Since transport is a matter of paramount importance at the present time the Minister strongly advises growers to make provision to secure at least a substantial proportion of their anticipated requirements at the earliest possible moment. In event of orders not being forthcoming from fruit and vegetables growers, it will be necessary to release cases for other purposes.

Mr. Dunn desires to make it clear that, while protecting the interests of fruit and vegetable growers, the Government wishes to interfere as little as possible with the legitimate trade, and invites the co-operation of those interested in the fruit case trade with his Department in order to make the scheme effective.

The Farmer His Own Blacksmith.

Laying Ploughshares.

Making Eye-bolts and Gate Hinges.

H. PALAZZI, Grenfell.

THE following directions and hints contributed by Mr. Palazzi make a useful supplement to the series of articles on farm blacksmithing which appeared in recent issues of this journal.

A knowledge of blacksmithing can prove both profitable and interesting—especially profitable in the case of farm machinery breakdowns, which might otherwise hold up farm operations awaiting repairs or the securing of a new part. To most farmers the making of eye-bolts, gate hinges and a hundred and one other useful items for farm use provides an interesting wet weather job.

The Importance of Correct Heating.

It is always well to remember that blacksmithing is done *in the fire,* rather than *on the anvil.* If your material (iron or steel)

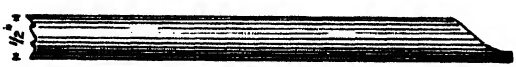


Fig. 1.—End of Bar Scarfed.
First operation in making an eye-bolt.

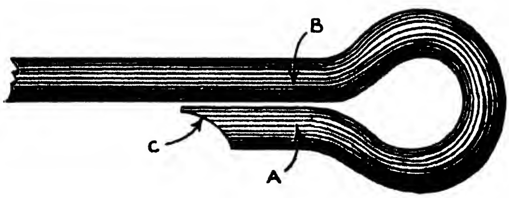


Fig. 2.—Bar Roughly Shaped.

is correctly heated and free from dirt, subsequent processing, whether it be welding, bending, forging or tempering, will prove comparatively simple, although at times strenuous. It is important, particularly when welding, to keep the job free of dirt

or slag. The practice of using the forge to heat soldering irons is a frequent cause of trouble, for it is impossible to get a welding heat when solder is present; the iron just "burns" and will not attain the plastic condition necessary for welding. The same applies when galvanised iron has been heated in the fire. "Burning" is indicated by a great profusion of sparks from the iron in the fire, and the iron will not take on that dazzling "white heat" necessary for welding. Iron is "burned" when all the carbon has been extracted and the metal becomes just cast iron, which is exceedingly brittle.

Don't keep on hammering at a job after it has become "cold," that is, when it has reached a degree of cooling where it becomes difficult to "work"; much time and energy is saved if the job is re-heated.

Never be sparing in the use of coal or charcoal, whichever is preferred. A big fire is half the battle; it gives a quicker, cleaner and more even heat, which can be applied at the point required to best advantage.

Oxidation or "Scaling."

This is caused by the heated iron absorbing oxygen from the air, and is guarded against by keeping plenty of fire between

the iron which is being heated and the incoming blast. This ensures that the oxygen is all burnt out of the bellows air before it reaches the heated metal. Oxidation can also be minimised by the use of a flux—sand, for example. The flux melts at a lower temperature than the iron and consequently burns up any oxide.

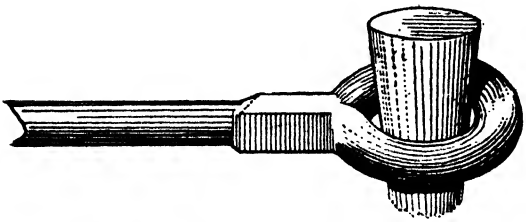


Fig. 3.—The Eye-bolt is Shaped on a Mandrel or Drift.

The Laying of Ploughshares.

Laying is done by welding a new point to a worn share, or even a new face the full length of the wing, which is a difficult job and requires considerable experience.

I have found the "chilling" method much simpler and very effective. When you buy a new share you will notice, on the underside of the point, a lump of iron apparently just stuck on. It is, in fact, a lump of cast iron just stuck on and chilled, and when the original one has worn away another lump can be put on without much trouble. Take your share, point it and dress the wing. Then obtain a piece of cast iron, in bar form if possible—part of an old stove grate serves well. Cast iron will not weld, but it will stick to wrought iron or mild steel brought to a welding heat. Take a welding heat on the underside of the point of your share (a full plastic heat is not necessary, a running heat will do), at the same time getting a nice white crumbly heat on the end of your cast iron. Next turn the share upside down on the anvil, place the crumbly point of the cast iron at the required spot and have your striker press down on it with his sledge—do not hit it, for it will fly. Drop the remainder of the

EXPLANATION OF TERMS USED.

To Describe Iron Heating.

AT welding heat, iron or steel is in a partial state of fusion on the surface and is in an extremely plastic state. Hammering or pressure will cause two such surfaces to adhere.

Iron is at *plastic* heat when it is heated right through, so that it is quite soft and pliable, or plastic, and may be moulded easily to any desired shape.

A *running* heat or *wash* obtains when the iron is brought to a welding heat only superficially, and not heated right through as in the case of plastic heat.

When an uneven mass is to be welded, a slow or *soaking* heat is necessary in order to distribute the heat evenly over light and heavy parts alike.

A *flying* heat is necessary where the parts to be welded have to be kept apart during heating.

When cast iron is heated to a *white crumbly* heat, it will crumble like dry bread, and it then has just about the same tensile strength.

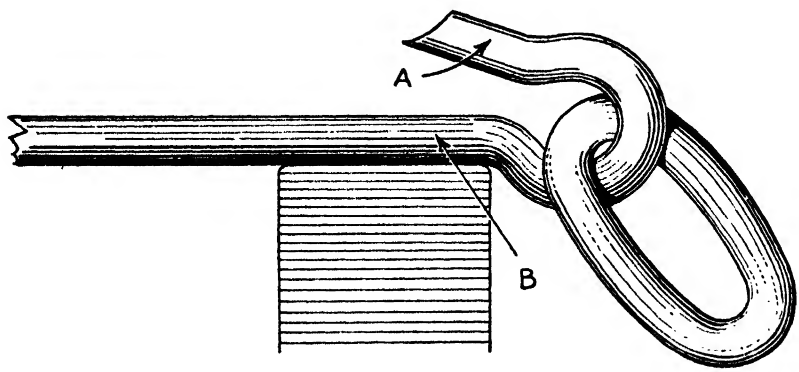


Fig. 4.

Fitting a Link to an Eye-bolt.

The link is placed before welding.

cast bar, dress the job as well as possible (after it has stuck it can be hammered lightly) and, while still white hot, plunge into water and cool right out. Chilled cast iron is glass hard. In this way I have kept shares nicely pointed until the wing has been worn completely away.

To Make Eye-bolts.

To make eye-bolts take your bar of, say, ½-inch round iron in a handy length, say, 3 feet, and scarf the end (Fig. 1). Then, using the horn of the anvil, turn the end of the bar roughly to the required shape and size (Fig. 2). Next get good soaking heat at points A and B (Fig. 2), being careful not to burn at point C, where the body of material is less and will heat more

striker drops the ring into place quickly and the weld is completed as previously described.

Gate Hinges.

To make gate hinges use 2-inch x ¼-inch flat iron and ⅝-inch round iron for the gudgeons.

Bend the flat iron roughly to shape on the horn of the anvil, leaving a flap of about 3 inches to take the bolt hole (Fig. 5). Heat again and dress, using a short piece of ¾-inch round iron as a mandrel (Fig. 6); do not weld. In this case, as in nearly all bending jobs, have your iron as hot as possible, for the softer it is the easier it is to work, but do not take it to the welding stage.

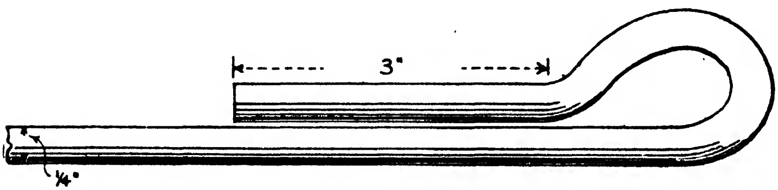


Fig. 5.
A Gate Hinge Roughly Shaped.

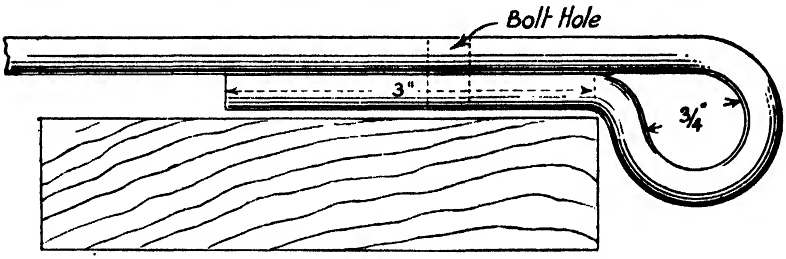


Fig. 6.
The Hinge Dressed and Shaped on a Mandrel.

quickly. Use plenty of sand at this point as it helps to slow up the heating and thus make it more uniform. When the correct heat is obtained, place on the anvil and strike at points A and B, forging to a square shape; then lightly dress the scarf. The eye-bolt is then shaped on a mandrel or drift (Fig. 3) and cut to the length desired.

If a ring or chain is to be attached it is done in the following way. After turning the end of the bar (as in Fig. 2), the eye is shaped on a mandrel before welding; it is then opened (using a drift) sufficient for the ring to pass through (see Fig. 4). Then a 'flying' heat is taken at points A and B (Fig. 2) and the eye-bolt held on the anvil, whilst the

For the gudgeon take your round iron bar in a handy length, scarf the end, and, with your fuller, prepare as at points A and B (Figs. 7 and 8); bend to shape (Fig. 9), leaving slightly open to receive stud. Place the stud (piece of ⅝ inch round by 3½ inches long) in eye, allowing it to protrude at back of gudgeon about ⅜ inch, and close the flap. This clamps the stud firmly whilst heat is taken. A good soaking heat is now taken (using sand freely by sprinkling) with the stud mostly upright in the fire, exercising care to get the short end of the stud to a welding heat. Place on the anvil, and with a few smart blows weld down the flap firmly to a square shape, then hammer round the "boss," holding at an angle on the

anvil (Fig. 10). Next, turn the job upside down, put the stud through a "bolster" and weld down the back of the stud (Fig. 11); dress and cut to required length. With a little experience this weld can be done in one heat, but at first it may be necessary to take two heats to complete the job satisfactorily.

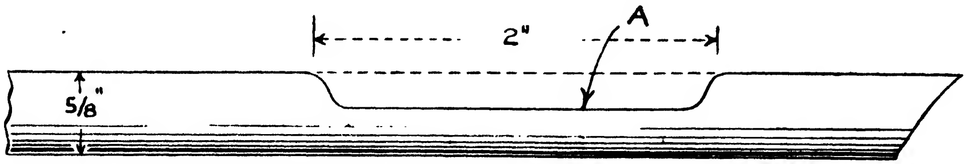


Fig. 7.—First Stage in Preparation of Gate Hinge Gudgeon. (Side View).
The end of the bar has been scarfed and a 2-inch section has been flattened.

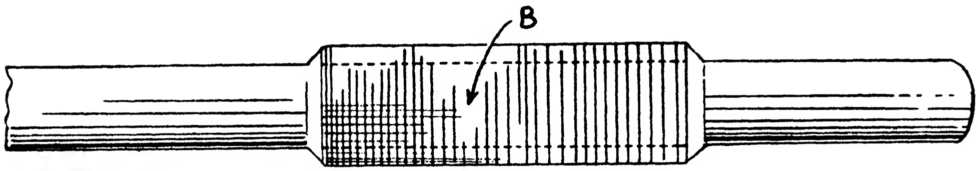


Fig. 8.—Top View of Bar as in Fig. 7

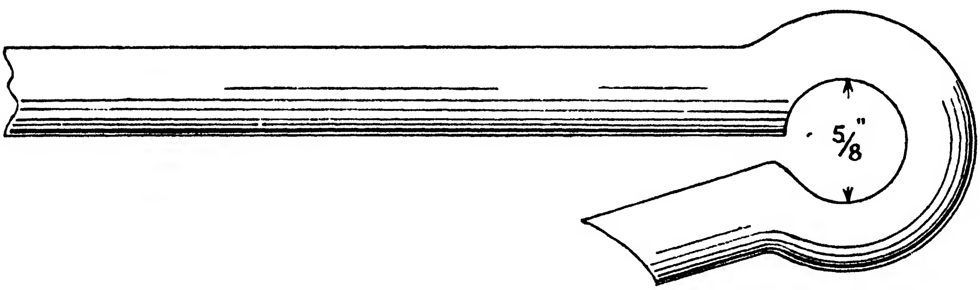


Fig. 9.—The Bar Bent, Ready to Receive the Stud.

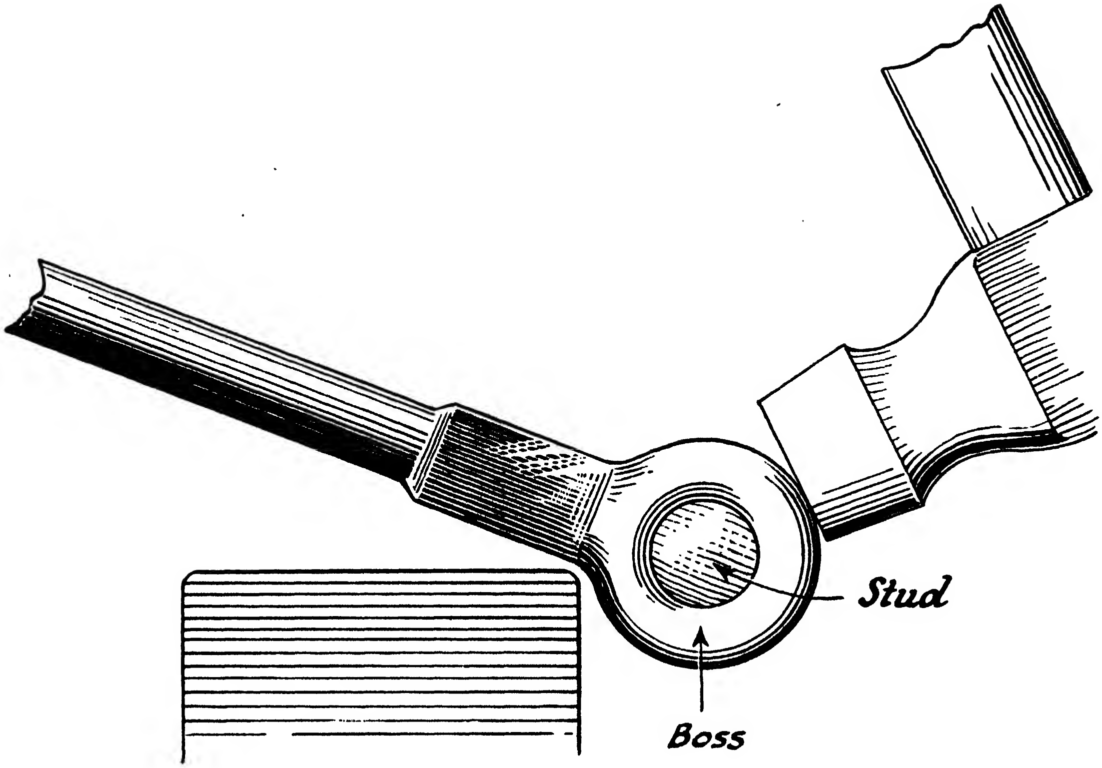


Fig. 10.—Welding the Stud into the Boss of the Gudgeon.

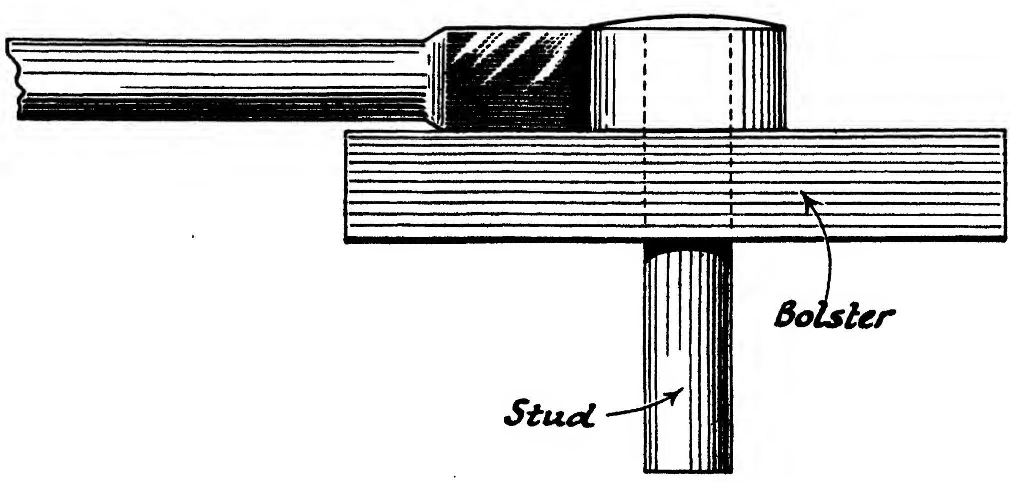


Fig. 11.—Side View of Completed Gudgeon.
A bolster is used when welding down the back of the stud.

FEEDS and FEEDING NOTES.

FEEDING DAIRY CATTLE.

(*Continued from Vol.* 53, *page* 557.)

G. L. McCLYMONT, B.V.Sc., Veterinary Officer.

THE December issue contained a brief discussion of the principal nutritional and economic factors concerned in feeding dairy cattle. This continuation of the article discusses the application of those principles to the feeding of cattle under the different conditions encountered in this State.

In general, feeding of cattle in this State may be classified into three broad types:—

(1) Pasture feeding.
(2) Supplementary feeding.
(3) Hand feeding.

Pasture Feeding.

Feeding standards have little practical application under these circumstances, as no ration has to be calculated, but the management of the cattle and the pastures should aim at increasing the nutritional value of the feed and providing, where possible, a year-round source of rich foodstuff. It is not within the scope of this article to discuss the finer details of pasture management and provision of fodder crops, as numerous pamphlets on the subject and the advice of departmental specialists are available to dairy farmers, but the following are the principles involved:—

(1) Provision of improved pastures containing winter-growing grasses and clovers.
(2) Top dressing, renovation, subdivision and rotation of pastures.
(3) Cutting and conserving of surplus pasture growth.
(4) Provision of supplementary fodder crops for feeding off and fodder conservation.

Rich pasture, *i.e.*, short (4 to 5 inches in height) growth of mixed grasses and clovers is the ideal and cheapest feed for dairy cattle, and no supplements are required owing to its high content of protein and digestible food matter. In fact, some of it is so rich in protein that it is virtually a protein concentrate. Thus, a cow eating 140 lb. of first-class pasture would obtain starch units for about 5 gallons and protein units for about 10 gallons. In contrast, if a cow could consume the same amount of mature paspalum, which it probably could not, it would obtain starch units sufficient for 3½ gallons but protein units for only 2½ gallons.

The chief objection to improved pasture is the initial capital cost, but the ultimate economy of providing year-round pasture is evident when one takes into account the cost of starch units in pasture, $\frac{1}{10}$d. to ¼d., as against ½d. in conserved roughages, and 1d. to 1½d. in bought concentrates. In addition there is the stimulating effect that young pasture apparently has on milk production, and the greater yield of food matter per acre, with consequent increased carrying capacity, and in turn, increased milk or butter fat yield per acre. The improved capital value of land which is allowed for under the Agricultural Holdings Act, is another factor of no small importance in considering the economics of improved pasture.

Supplementary Feeding.

As pasture matures the protein content of the feed quickly falls. Thus when feed has reached the flowering stage, protein deficiency may limit production from the higher producers and cause a drain on their body protein reserves; supplementary feeding with young crops or high protein content conserved roughage will thus be necessary to maintain maximum production. However, in cattle of average production no supplements should be needed.

As the pasture matures further, *i.e.*, seeds and dries off, the fibre content rises, protein content falls still further, and it becomes low in total food value. As an example of the fall in protein content as pasture matures, note the following figures from British experiments:—

Average Protein Content for five Seasons of Improved Pasture. (Estimated on the dried Pasture.)

Cut weekly	26·7 per cent.
Cut fortnightly	23·8 ,,
Cut every three weeks... ...	21·6 ,,
Cut in the mature stage ...	12·8 ,,

In addition to this fall in protein the palatability and the ease with which it is grazed by cattle decline. It has been found that no matter how poor or rich the pasture may be, dairy cattle do not, on the average, graze, *i.e.*, consume pasture, for longer than about eight hours per day. Hence increased difficulty in grazing on mature pasture will be reflected in lowered feed intake and lowered production. On mature, sparse pasture, the amount of pasturage eaten may fall to about 50 lb., that is hardly a maintenance ration.

Thus only cattle of low production will continue their maximum yield without loss of weight on this type of feed, and usually supplementary feeding of all cattle is necessary. Good cereal hay or silage or grazing on fodder crops will usually allow average producers to give their maximum without draining body reserves, but owing to the comparatively low protein content of the grass and this type of supplementary feed, some protein-rich supplements, such as good grass and clover hay or silage, or lucerne hay, silage or grazing, is necessary for cattle of higher production. If such roughage is not available or is expensive, protein concentrates, such as oil

meals or meat meals, can usually be fed economically. In any case, protein concentrates will usually be necessary for high producers.

It is difficult to advise any definite quantities of supplementary feed, as the quality, quantity and palatability of pasture vary so widely. The best guide is the response of the cattle at various levels of supplementary feeding. However, a rough guide as to quantities can be obtained by noting the food value of the pasture, that is, whether it will only maintain dry cattle, maintain production of 1 gallon per head and so on. Balanced supplementary feed for different levels of production can then be worked out to supplement the pasture. For instance it may be found that pasture only enables production of about 1 gallon per head, and it may be known that the potential production of the herd is 3 gallons per head. Thus roughage and/or concentrates to supply protein and starch units for 2 gallons should be supplied.

In general, however, if fairly liberal feeding of cereal roughages and starch-rich feeds, as for example, feeding of sorghum silage and crushed maize, does not bring production up to the expected level, protein deficiency will usually be found to be the limiting factor. In Victorian experiments the use of small quantities, ½ to 1½ lb. per day, of meat meal for cattle on winter pasture and conserved fodder gave a remarkable increase in milk production and an increase in butter fat content, indicating the value of protein supplements on protein deficient feed.

Wholly Hand-fed.

This is only carried out during drought and in metropolitan dairies, but is practically adopted on some dairy farms during the winter, as the limited growth of pasture is often then of very low food value.

As indicated in last month's Notes, the basis of economical feeding is to feed the cattle according to size and production with the cheapest balanced rations. To do this, it is necesary to have some idea as to the weight of cattle and the butter fat content of the milk. The daily production from each cow should also be recorded. It is not necessary to do this for each day, but say only one day a week. These factors being known, the following steps should be taken:—

(1) Divide the cattle into groups on a weight basis.

(2) Further divide the cattle into groups on milk production and butter fat percentage. (The degree of group formation will depend on many factors such as number of cattle, weight variation, production variation, number of feeding bails, available labour, and other factors which may operate on individual farms.)

(3) Having decided on the groups, calculate from the tables as indicated in the following examples the requirements for each group in starch and protein units.

(4) If it is necessary to buy feed, obtain the prices, including cost of transport and cost of crushing if necessary, of all available feedstuffs, and calculate cost of starch, and where applicable, protein units. If roughages have to be bought, note whether they are cheaper or dearer than concentrates on a starch unit basis. Also decide from cost considerations which starch and protein concentrates are to be used. If they are heavy feeds such as crushed wheat or crushed barley, consider whether some leavening food such as bran or crushed oats will be necessary.

(5) As described in the following examples, calculate the rations for each group and arrange some simple and handy method of having the rations readily available to the feeder, such as chalked on a blackboard.

(6) Experiment with various containers so that handy-sized vessels can be used for measuring out given weights of feed. Dippers holding 2 or 4 lb. of concentrates are handy sizes. This must be repeated when the concentrate mixture is altered, owing to the different density of the different feed mixtures. The weight of average fork-, shovel-, or tin-fuls of each batch of chaff or silage or mixtures of these are also determined by trial.

(7) Feed the cows in their different production groups. (Sometimes this is considerably interfered with by hygienic methods for control of mastitis, *i.e.*, milking of affected cattle last.)

(8) Calculate the cost of production from cattle of different production levels and cull unprofitable cows.

(9) Follow the feed markets and adapt the ration so that it is composed of the cheapest feeds available. (However, where it is considered that it is only a temporary change in prices it may not pay to interrupt the feeding, as some trouble may be experienced in getting cattle on to the new feed.)

Examples of Grouping and Calculating Requirements.

Take, for example, a herd of eighty cows, thirty of them Jerseys and fifty of them Shorthorns and Ayrshires or their crosses. The Jerseys might possibly be grouped into one group of, say, 800 lb. live weight and 2 gallons of 5 per cent. fat content milk, and the remainder into three groups of 1,000 lb. live weight and 2, 3, and 4 gallons of 3.8 per cent. fat content milk.

The requirements for these groups would be as follows, the tables as given in the last issue being the source of the figures:—

	Starch Units.	Protein Units.
800-lb. Group—		
Maintenance requirement	5·1	0·48
Production requirement (2 × 3·1 and 2 × 0·62)	6·2	1·24
Total	11·3	1·72
1,000-lb. Group—		
Maintenance requirement	6·0	0·6
Production requirement for 2 gallons (2 × 2·5 and 2 × 0·5)	5·0	1·0
Total requirement for 2-gallon cow	11·0	1·6
Production requirement for 3 gallons (3 × 2·5 and 3 × 0·5)	7·5	1·5
Total requirement for 3-gallon cow	13·5	2·1
Production requirement for 4 gallons (4 × 2·5 and 4 × 0·5)	10·0	2·0
Total requirement for 4-gallon cow	16·0	2·6

That is, the requirements for each cow in each of the four groups are as follows:—

	Starch Units.	Protein Units.
800-lb. cows, 2 gallons, 5 per cent. milk ...	11·3	1·72
1,000-lb. „ 2 „ 3·8 „ ...	11·0	1·6
1,000-lb. „ 3 „ 3·8 „ ...	13·5	2·1
1,000-lb. „ 4 „ 3·8 „ ...	16·0	2·6

Working Out the Ration.

Having worked out the requirements for each group and the cheapest available feeds, the rations for the groups must be calculated. It is simplest to consider this for two different sets of circumstances. The first being when there is ample home-grown feed, *i.e.*, roughages and cereal grains, available.

Where Home-grown Feeds are Available.

Under these circumstances, the basis of economical feeding is to use the maximum of home-grown feeds and the minimum of bought feeds. The quality of the roughage will largely determine the amount and type of the latter that will be necessary. Consider, for example, two 1,000 lb. cows, one eating 25 lb. of oaten chaff, and another 25 lb. of good lucerne chaff. These quantities are well within the appetite of a 1,000 lb. cow if the roughage is of sufficient palatability. Let us compare the nutritive requirements of cattle of different levels of production and the nutritive contents of these quantities of chaff.

	Starch Units.	Protein Units.
Requirements for maintenance of 1,000-lb. cow ...	6·0	0·6
Requirements for production of 1 gallon of 3·8 per cent. milk ...	2·5	0·5
Requirement for 1-gallon cow...	8·5	1·1
„ „ 2-gallon „ ...	11·0	1·6
„ „ 3-gallon „ ...	13·5	2·1
„ „ 4-gallon „ ...	16·0	2·6
We know that—		
25 lb. oaten chaff contain ...	10·0	0·9
25 lb. average lucerne chaff contain...	10·0	2·5

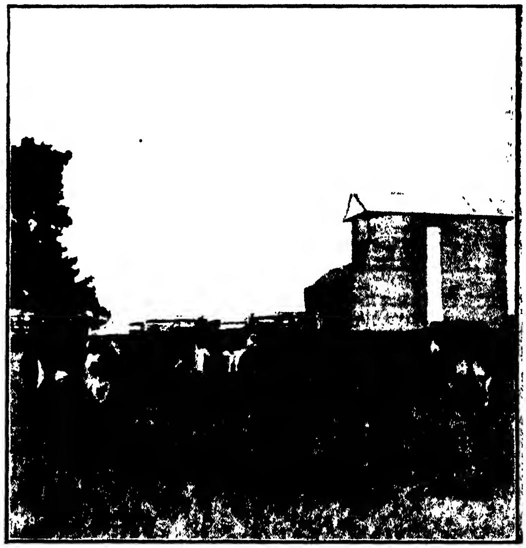
Thus, 25 lb. of oaten chaff contain starch units for maintenance and production of about 1½ gallons of milk, but protein units for maintenance and less than 1 gallon of milk. On the other hand, lucerne chaff contains sufficient starch units for maintenance of 1½ gallons of milk but protein units for maintenance and about 4 gallons.

In other words, the protein content of the cereal chaff limits production to about 1 gallon and the starch unit content of the lucerne chaff limits production to about 1½ gallons. Thus, in the cereal chaff there is a surplus of starch units and with lucerne chaff a surplus of protein units, so that the types of supplements required for cereal and lucerne chaffs are obvious—for cereal chaff, protein concentrates and for lucerne chaff, starchy concentrates.

The practical problem is—how much concentrates to bring the level of food intake up to requirements? Thus, if a 1,000 lb. cow with potential production capacity of 3 gallons of 3.8 per cent. milk is being fed 25 lb. of oaten chaff, the nutritive requirements to be obtained from supplements are calculated as follows:—

	Starch Units.	Protein Units.
Nutritive requirements for 1,000-lb. cow giving 3 gallons of 3·8 per cent. milk ...	13·5	2·1
Nutritive content of 25 lb. of oaten chaff...	10·0	0·9
Difference to be made up by supplements ...	3·5	1·2

That is, some supplement or mixture of supplements containing, in this case, 3.5 starch units and 1.2 protein units is required. This means that a concentrate with a ratio of starch to protein units of 3.5 to 1.2, or approximately 3 : 1, is required. The simplest way to decide on a supplement is to select a protein supplement with



Overhead Silos on a South Coast Farm.

about a 3 : 1 ratio, for example linseed meal (see tables). The quantity of linseed meal is easily worked out by trial and error or by simple mathematics.

Seventy-two starch units are contained in 100 lb. of linseed meal.

Therefore, one starch unit is contained in $\frac{100}{72}$ lb. of linseed meal, and

3·5 starch units are contained in $\frac{100 \times 3{\cdot}5}{72}$ starch units = 5 lb.

Thus, 25 lb. of oaten chaff and 5 lb. of linseed meal would provide sufficient food for the maintenance of a 1,000 lb. cow with a production of 3 gallons of 3.8 per cent. milk. The cost of this supplementary feed, which allows for the production of an extra 2 gallons of milk, would be, with linseed meal at present prices of about £9 10s. per ton, 5½d—quite a good investment.

Of course, mixtures of other starch and protein concentrates may be cheaper and may be worked out by trial and error, thus:—

	Starch Units.	Protein Units.
Peanut meal, 1 lb.	0·76	0·42
Meat meal, 1 lb.	0·8	0·55
Pollard, 3 lb.	2·0	0·3
	3·56	1·27

could be used at a cost of about 4d. at present prices. A mixture of supplementary feeds would also be preferable to a single supplement.

Now consider the case where 25 lb. of lucerne chaff is fed in place of oaten chaff.

	Starch Units.	Protein Units.
Nutritive requirements for 1,000-lb. cow giving 3 gallons of 3·8 per cent. milk ...	13·5	2·1
Nutritive content of 25 lb. lucerne chaff ...	10·0	2·5
Difference	— 3·5	+ 0·4

That is, there is a surplus of protein and only 3.5 starch units are required to bring the food intake up to the required level. Evidently a cheap starch rich feed is indicated, preferably a home-produced one.

Thus, 78 starch units are contained in 100 lb. of maize.

One starch unit is contained in $\frac{100}{78}$ lb. of maize,

and 3·5 starch units are contained in $\frac{100 \times 3·5}{78}$ lb. of maize = about 4½ lb.

Thus, 25 lb. of average lucerne chaff and 4½ lb. of maize would provide the requirements for the above cow. The cost of this supplement with maize grown at 3s. 6d. per bushel would be about 3½d.

Other suitable starch-rich feeds for supplementing the lucerne could be crushed barley, crushed wheat, crushed sorghum, crushed oats or pollard.

From these examples of supplementing home-grown roughage, it can be seen that the bases of economical hand-feeding, using home-grown feeds, are:—

(*a*) To grow and conserve as much protein rich roughage as possible. The silages and hays made from lucerne, clover and young mixed pasture fall into this group. (Advice on conservation of such roughages is available from the Department.)

(*b*) To grow starch rich feeds, *i.e.*, cereal grains, to supplement these protein rich roughages.

As regards the steps to be taken in working out the rations, the following is a summary of the principles used in the two examples:—

Give the cattle as much roughage as they will eat (but not so that the low producers are overfed) or as much as stocks of conserved fodder will allow.

Calculate the starch and protein units in the weight of roughage consumed (taking into account the quality of the roughage).

Calculate the requirements of the groups of cattle.

Subtract the starch and protein units in the feed from the starch and protein units required for each group and note the difference.

Use the cheapest concentrates to make up the difference between nutritive requirements for each group and nutritive intake from the roughage.

It may be thought that if a cow is consuming large quantities of roughage, she will not have an appetite for any concentrates, but in practice it is found that several pounds of concentrates will be eaten in addition to a full feed of roughage, up to 30 lb. of lucerne hay and 5 lb. of concentrates being eaten in some trials. However, with cattle giving over about 4 gallons a day, it may be necessary to reduce the roughage progressively as the concentrates increase, otherwise the cow's appetite will be exceeded.

RATIONS using maximum roughage, for 1,000 lb. cow, giving 3 gallons of 3.8 per cent. milk.

Requirements.	Equivalent Dry Food Weight.	Starch Units.	Protein Units.
Maintenance	...	6·0	0·6
Production	...	7·5	1·5
		13·5	2·1
25 lb. of below-average oaten chaff	31½ lb.	9·0	0·9
4 lb. linseed meal		2·9	1·0
2½ lb. pollard		1·6	0·2
		13·5	2·1
25 lb. very good lucerne chaff ...	28 lb.	11·0	2·5
3⅓ lb. crushed maize		2·6	0·26
		13·6	2·76
30 lb. very good lucerne chaff ...	30 lb.	13·5	3·0
25 lb. average lucerne chaff ...	30½ lb.	10·0	2·5
5½ lb. crushed oats		3·5	0·45
		13·5	2·95
40 lb. maize silage	32 lb.	4·8	0·6
15 lb. fair lucerne chaff		6·0	1·2
5 lb. crushed oats		3·1	0·4
		13·9	2·2
40 lb. chaffed sorghum	36 lb.	3·6	0·4
20 lb. clover hay		7·6	1·6
3 lb. wheatmeal		2·2	0·2
		13·4	2·2
50 lb. sorghum silage	33 lb.	6·0	0·75
10 lb. wheaten chaff		4·0	0·36
1 lb. meat meal		0·8	0·55
5 lb. bran		2·7	0·5
		13·5	2·16
50 lb. lucerne silage	30 lb.	6·5	1·5
30 lb. green barley		3·3	0·6
5½ lb. crushed barley		3·9	0·38
		13·7	2·48
60 lb. mangolds	35 lb.	4·2	0·42
15 lb. lucerne hay		6·7	1·2
5 lb. bran		2·7	0·5
		13·6	2·12
50 lb. green oats	33 lb.	5·0	1·0
15 lb. good grass hay		5·7	0·75
5 lb. crushed oats		3·1	0·4
		13·8	2·15

Examples of rations using maximum roughage for 1,000 lb. cows giving 3 gallons of 3.8 per cent. milk, or less exactly, a 900 lb. cow giving 3 gallons of 5 per cent. milk, are given in the accompanying table. Of course, some cows will eat greater or lesser quantities of roughage, its palatability being an influencing factor. The more roughage consumed, in general, the more economic is the milk production.

(To be continued.)

Current Feed Costs.

In future Notes only those feeds which have had a significant change in their price since the previous issue will be quoted in these feed-costs notes. The prices and food unit costs of other feeds may be found by reference to the previous issue of the *Gazette*.

It will be readily realised that a price ruling at the time an issue of the *Gazette* goes to print may quite easily change before the time of distribution. Thus the prices quoted should not be taken as necessarily those ruling at the time of reading, though they should always give a good indication of the price trends. If the ruling price, as ascertained from the papers or feed merchants, is greatly different to that quoted in the notes, or freight charges are high for some feeds, the food unit cost could be worked out as described in previous issues.

The following list includes those feeds which have altered appreciably in price since the last issue, the fall in price of oats being the most noticeable and making it a very reasonably-priced feed.

Feed.	Starch Units per 100 lb.	Protein Units per 100 lb.	Cost.	Cost per Starch Unit.	Cost per Protein Unit.	Remarks.
Lucerne hay or chaff (good sound).	35–45 (Average quality 40).	9	£5–£7 10s. per long ton.*	1.3d. 2d.	...	Good quality lucerne at lower prices is good buying, as starch unit price is approaching that of grains, and there is the additional value of the extra protein, Vitamin A and calcium.
Oaten chaff (good sound).	40	3	£7–£8 per long ton*	2d.–2.1d.	...	Cereal chaffs somewhat dearer than lucerne.
Wheaten chaff (good sound).	40	3	£5 10s.–£7 per long ton.*	1.5d.–2d.	...	Cereal chaffs somewhat dearer than lucerne.
Oats	62	8	2s. 3d. per bushel (40 lb.).	1.1d.	...	Fall in price makes oats about equal in price to wheat and barley, and owing to ease of feeding is probably better buying.
Crushed oats...	62	8	3s. per 40 lb. ...	1.5d.	...	Will probably pay to crush own grain at this price.
Hominy meal..	78	8	20s. per cwt. ...	3.1d.	...	A rise in price.

* Long ton = 2,240 lb.

Metal Foils for Milk Bottle Caps.

In the *Journal of the Society of Chemical Industry*, August, 1942, R. Kerr, M.Sc., Ph.D., describes investigations of the effects of certain alloys in contact with milk, undertaken when the war situation made it necessary to find a substitute for aluminium caps.

The substitutes proposed were a tin-zinc alloy (92 per cent. tin), tinned lead foil and tinned copper foil. In some tests specimens of foil were immersed in milk, and in other cases bottles of milk were capped with the foils. The effect on the milk and the quantities of metals absorbed were determined.

It was found that undesirable contamination arises when milk bottles are capped with tinned lead foil, as the foil interacts into the cream layer. Satisfactory results were, however, obtained from the trials with tinned copper and the tin-zinc alloy foils.

The production of a satisfactory thin copper foil coated with tin was found uneconomic in war time, and as the physical properties of the tin-zinc alloy were satisfactory and it could be readily made with the standard equipment, a 100 per cent. substitution was effected. It was used until the need for tin economy arose as a result of the war in the Far East.

TO BREED PIGS SUCCESSFULLY.

Breed Type Must Conform to Carcase Type.

G. M. D. CARSE, H.D.D., Piggery Instructor, Hawkesbury Agricultural College.

TWO hundred years ago systematic breeding of pigs was practically unknown. Pigs were then rough and coarse, short-bodied, heavy in the forequarters, long in the leg and heavy-boned; whilst the sows farrowed small litters only once a year. During the following hundred years pig-breeding made marked progress. By controlled breeding and selection of stock an effort was made to provide pigs capable of producing a maximum quantity of meat and fat to suit the public taste of that time. Attention was also paid to prolificacy and fecundity with success. The end of the nineteenth century saw pig-breeding placed on a sound footing, and even since then still further rapid progress has been made. To-day it is recognised as an occupation demanding skill, knowledge and experience.

Apart from such factors as efficient management—good feeding and good housing—and the maintenance of good health, the essence of good breeding lies in the selection of sire and dam. The problem can be divided into the following four main headings, each of which must be taken into account by the breeder:—(1) Breeding factors; (2) breed points; (3) carcase points; (4) general appearance.

Breeding Factors.

The two main elementary breeding factors are prolificacy and fecundity. Prolificacy is the capacity to beget progeny regularly and in conveniently large numbers, and fecundity is the ability to rear successfully the pigs so born. Both factors are genetic or inherited and, in choosing a boar or sow for breeding purposes, it is therefore important to see that they are from proved strains of blood noted for the regular production of large litters. In the case of pure-bred, registered stock, it is an easy matter to obtain this information, and the boar, at least, should always be registered in the books of the Australian Stud Pig Breeders' Society.

A study of the records of successful breeders will show that they aim to have their brood sows carrying at least one line of blood similar to one of the lines carried by the boar to which they are to be mated. In that way they attempt to "fix" or develop qualities, not only of prolificacy and fecundity, but of type and constitution as well. Known as "line-breeding," the practice can be accepted as sound. Line-breeding can be applied, even in cross-breeding, by using the "come-back" method intelligently. That is to say, the boar to which the first cross sow is mated back, should be line-bred to the sire or dam used in the first instance.

Other breeding factors which must be taken into account are a strong constitution, with which is allied full development of body size, and ample mammary development. A strong constitution and well-grown body are obviously required if a boar or sow is to be called on for regular and continuous breeding. In the sow possession of twelve well-spaced teats showing evidence of udder formation is essential if large litters are to be successfully suckled. The boar should show twelve well-formed rudimentary teats and the fully developed testicles should be evenly and well-attached.

Breed Points.

Since "Standards of Excellence" were standardised for the leading breeds in New South Wales, the only points peculiar to the individual breeds which require to be considered are those relating to colour, and possibly the shape of the head, including the ears. But a tendency has been observed amongst breeders and judges in recent years to avoid too rigid an adherence to colour standards, and to develop a "carcase" approach to the question. For instance, in the Berkshire breed, pigs with white in the ears, with black feet or even with a splash of white on the flank have been seen amongst Sydney Royal Show prize-winners. This is all to the good, as, after all, it is the utility aspect of a breed which should matter most.

Carcase Points.

Dr. John Hammond and his co-workers, in giving the pig-breeding world details of their "bacon and pork pig carcase appraisal method," forced pig-breeders to realise the supreme importance of making breed type conform to carcase type. The type is precisely the same for all breeds. That is to say, the head should be small and neat; the neck and shoulders light and free from coarseness; the top and belly lines straight and almost parallel; the body long and of medium depth; the hams meaty and well developed and the legs short and straight. The hair and skin should be fine and smooth.

General Appearance.

As all constructive breeders like to breed animals which are pleasing to the eye, quite apart from the purely utility aspect, the general appearance of a pig intended for breeding purposes must be taken into account. Breeders look for what is called "character" in a pig. They look for a balance of conformation, a general suggestion of smooth uniformity or symmetry—almost a stream-lined effect—in a boar or a sow selected

(*Continued on page 32.*)

1941 Stallion Parades Reviewed.

Sidebone the Commonest Cause of Rejection.

MAX HENRY, B.V.Sc., M.R.C.V.S., Chief, Division of Animal Industry.

THE Horse Breeding Act, 1940, which came into effect on 7th February, 1941, required particulars to be furnished to the Department of Agriculture of all stallions, except thoroughbreds entered in the Australian Stud Book, stallions in the Western Division of the State and stallions under two years old. If an owner wished to mate his horse with other owners' mares, it was also necessary for registration under the Act to be applied for, the fee of £3/3/- paid and the stallion presented for examination by and the approval of a Veterinary Officer of the Department.

The first examinations of stallions in accordance with the provisions of the above Act took place at the Royal Empire Show in April, 1941, when thirty-seven stallions, in respect of which application for registration had been received, were examined. Three horses were rejected at these examinations; the owners of two exercised their right to appeal under the Act, but in both cases the Appeal Board upheld the original decision.

At the 1941 series of country parades conducted during the period 10th July to 31st December, 1941, the number of stallions examined was 971. Of these, 193 were rejected as being affected with one or more of the diseases enumerated in Regulation 18 under the Act, or because these horses were not of the approved standard as regards type, conformation and breeding. Twenty of the owners whose horses were rejected at these country parades, formally appealed, and of these three were upheld.

Details showing the reasons for the rejection of the stallions are given in the accompanying table. Of all the stallions examined to 31st December, 19.87 per cent. were rejected. This figure is somewhat lower than was the case in Victoria in the first series of parades held under a similar scheme in that State, when 23.42 per cent. of the stallions examined were rejected.

The commonest cause for rejection was the presence of sidebone, and this was most marked in the draught horses examined. Of the draught horses rejected, 48.5 per cent. were rejected for sidebone. In this connection, it may be of interest to note that in Victoria, in each of the first three years of stallion examinations (1907 to 1909 inclusive), the percentage of draughts rejected for sidebone amounted to approximately 62 per cent. of all draughts rejected.

The funds received in connection with the registration of horses are credited to a Horse Breeding Fund, and this fund is debited with the costs of administering the Act. Half the fee of £3/3/- is refunded to owners whose horses are rejected.

Owing to staff shortages, petrol restrictions and other difficulties associated with the war, it was found necessary to suspend entirely the provisions of the Act for a period of twelve months terminating on 31st January, 1943, and during this period the restrictions imposed by the Act relating to the use of stallions for breeding purposes, have not been enforced.

Analysis of Rejections of Stallions at 1941 Parades.

	Total.	Cause of Rejection.								
		Sidebones.	Ringbones.	Defective Genital Organs.	Other Diseases.	Sidebone and Ringbone.	Type.	Type and Sidebone.	Type and Ringbone.	Type and Other Diseases.
Clydesdales	154	77	11	5	4	6	31	11	6	3
Suffolk Punch	3	3	...	...	...	...	...	...	...	...
Crossbred Draughts ...	8	...	...	...	...	...	8	...	...	...
Galloway	1	...	...	1	...	...	...	...	...	...
Percherons	2	1	...	...	...	...	...	1	...	...
Cob	1	...	...	...	...	...	1	...	...	...
Thoroughbreds ...	8	...	1	2	...	...	5	...	...	...
Trotters	2	...	...	...	...	...	1	1	...	...
Arabs	1	...	...	...	...	...	1	...	...	...
Ponies	11	2	1	2	...	...	6	...	...	...
Crossbred Saddle Horses	5	1	...	...	...	...	3	...	...	1
TOTAL	196	84	13	10	4	6	56	13	6	4

THE EFFECT OF THE EARLY-SEASON RAINS.

THE copious and widespread rainfall early in the season promised an abundant growth of ground flora (very useful as a source of honey and pollen supply), and it was anticipated that production from the early flowering eucalypts would be improved. The conditions, however, also proved ideal for the breeding of a multitude of insect pests (thrip, etc.), which infested the blossoms. A real plague of the insects occurred throughout most districts of the State, and bee-farmers have experienced a very anxious time in endeavouring to maintain their colonies in reasonable strength. Losses have occurred, but they would have been disastrous in some places such as Forbes, etc., had not the Deputy-Director of Rationing arranged for the release of supplies of sugar in sufficient quantity to prevent actual starvation in the hives.

The extensive rainfall also stimulated the eucalyptus trees to such extent that they produced a prolific new growth of foliage along with their already present supply of buds and flowers. The new growth may ensure excellent honey flow prospects for next season, but it is hardly likely that the trees will provide sufficient substance to support the new foliage and, at the same time, a full secretion of nectar for this season's production. With the insect interference with the honey flow it has not been possible as yet to determine the extent to which the new growth has affected nectar secretion, but it is hoped that the occasion will prove an exception to the general rule. There is still a good half of the season ahead in which to make up some of the leeway in production, and it should at least be free of insect infestation.

WAR Agricultural Committees have been established throughout the State to ensure maximum efficiency in primary industries in this time of national emergency. Beekeepers are advised to co-operate fully with these organisations which are so constituted that they are able to deal efficiently with producers' problems and needs.

Raising Queen Cells by a New Method.

A new and simplified method of raising queen cells has been evolved at Hawkesbury Agricultural College. It has the advantages that there is no necessity for the making of a colony queenless, there is no reduction in production of honey in the hive employed, and no special type of hive need be constructed. The procedure is as follows:—

Select a populous hive where the bees are in good heart and remove it from its stand. Then place on the stand a full depth hive

body with bottom board attached, and in this new section and over toward the side wall, insert two frames of capped brood, and on each side of these place a comb containing some honey and pollen. A division board should then be inserted so as to make the section compact. The empty portion of

Manipulation of Hive in Queen Raising.
Position of the main hive after removal from stand.

this hive-body is employed as a feeding compartment, as some stimulation of the cell-raising colony is necessary for a commencement, even though conditions in the fields may be fairly progressive. A feeder containing a pint or two of sugar syrup or thinned-down honey may now be placed toward the rear of the hive body, some slats of board or pieces of comb being inserted in the container to prevent bees being drowned. The main hive just moved from its stand is then placed over the new section, the bottom board being left on the ground.

This preparation work should be carried out during the morning so as to give the colony time to settle down, and the bees will then be in a condition during the afternoon to accept several bars of cell cups to which larvae from well bred stock have been transferred.

About an hour before grafting the larvae, lift off the top sections of the hive and place this portion on the bottom board previously left on the ground. Then inspect the new section to ensure that the queen has not worked down into it; there is rarely any bother in this direction at the College and a queen excluder is not used; it is thought, in fact, that better results are obtained without an excluder, the bees having more freedom of movement.

A cover should be placed on the new section and the bees returning from the fields will crowd into it. The main hive, removed from its stand, should occupy a position at the rear, several feet away from, and crosswise to the new section. The accompanying illustrations shows the position of the hive and how the new section is fitted in readiness to receive a cell-raising frame.

One cell-raising frame containing one or two bars, as required, of cell cups which have been grafted with special larvae may be inserted in the new section between the two frames of brood. The hive cover is replaced and the bees are left to commence the feeding of the larvae and construction of queen cells. The cell-bar is left overnight in the hive so that the Royal larvae will receive the full benefit of intensive feeding, which the house bees attracted to the feeder, and the crowd of field bees collected in the new section are prepared to supply.

On completion of the overnight feeding the cells, which should then show prominent development, are transferred to feeding colonies. The main portion of the cell-

New Section, Ready for the Cell-raising Bar.

raising hive is replaced in position over the new section, and the colony allowed to proceed with normal productive work until again required for starting further batches of queen cells.

So much success has attended this new method at the College, that it is now employed to the exclusion of all others.

Dealing with A.F.B. Disease.

In dealing with hives of bees which have contracted A.F.B. (Bacillus larvae) disease in an advanced stage, the plan adopted by the Department, and almost invariably acquiesced in by the bee-farmer concerned, is to gas the bees and burn the whole hive outright. With a lightly infected hive, however, where only a few cells of the brood show symptoms of the disease, and the bees are in good heart and in fair strength, the treatment may consist of transfer of the colony to a clean hive, the frames of which are fitted with comb-foundation. For this treatment to be successful, the transfer should be made at a time when ample food supplies are available from the fields. With seasons like the present one, there is always some risk attached to holding a diseased hive in the apiary awaiting favourable conditions, and to avoid doing so, we have been trying a revised form of treatment which has so far proved to be very successful. The bees are transferred to frames of foundation in a clean hive as usual during the late afternoon, and provision is made for the placing of a feeder. After being overnight in the new hive, the colony is given a pint of sugar syrup, and light feeding is continued each day until the bees become firmly established with combs and brood. The bees require an ample supply of food for successful treatment and this is given them by artificial feeding.

Living Opinion—Listening Group Talks.

THE British Broadcasting Commission recently experimented in the field of using broadcasting to reflect the general experience and attitude of working-class people in relation to contemporary ideas and ideals.

The Australian Broadcasting Commission has received from the B.B.C. recordings of two discussions held by a group of quarrymen in Wales. The subjects—"What shall we do with our Future," and "Culture and Manual Labour"—were submitted to groups of workmen in railway workshops near Sydney and the discussions were recorded.

As part of the summer programme for listening group talks, these recordings will be broadcast from 8 p.m. to 8.20 p.m. through stations 2BL, 2NC, 2CR, 3LO, 3WV, 4QR, 5CL and 7ZR, as follows:—

"What Shall We Do with Our Future"—

January 4, 1943—Welsh quarrymen.

January 11, 1943—Australian workmen.

"Culture and Manual Labour"—

January 8, 1943—Welsh quarrymen.

January 25, 1943—Australian workmen.

To Breed Pigs Successfully.

(*Continued from page* 28.)

for breeding. Character is also to be found in a shapely, well-proportioned head, width between eyes and ears, large eyes, smooth cheeks, clean cut jowl and a broad snout. A free gait and a quiet temperament are further evidence of good breeding.

Management.

No matter how good breeding stock are, however, good results in breeding will not be obtained unless pigs are efficiently managed. Pig breeding requires organising ability in the first instance backed up with what might be called "stock-sense." Pig breeders must plan ahead their mating arrangements, the shed and yard accommodation, the feed supply and the final marketing. Above all they have to keep detailed and accurate records of all stock work.

It is well to remember that pork pigs should be marketed before they are five months old and bacon pigs before they are seven months old, whilst boars and sows selected for breeding purposes commence their stud careers when only nine months old. There is, accordingly, no time for mistakes. A plentiful supply of good feed must be available and no set-backs allowed from bad housing, bad drainage, lack of knowledge or any other factor which might lead to bad health. Every time a pig catches a cold, is irregularly or insufficiently fed, or is irritated by vermin, its marketing is delayed or its breeding power impaired, and such delay or impairment means a direct reduction in profits.

LIVESTOCK LOSSES ARE LIGHT.

FIGURES published from time to time showing the number of animals killed or crippled during railway transport appear to have created the impression that losses from this cause are excessive. Probably, many people who see those figures are unaware of the extent of the livestock traffic in New South Wales and do not know, therefore, how the "casualties" compare with the huge number of sheep and cattle hauled in railway wagons.

In a year, about 12,000,000 sheep and 700,000 cattle are carried by railway in this State. These include large numbers of lambs and calves. Approximately one-third are trucked to the livestock market at Flemington. The percentages of dead or crippled cattle and sheep arriving there are, respectively, .15 and .39—in other words, one beast in every 60-70 trucks of cattle and two sheep in every five trucks.

These figures cannot be regarded as disproportionately high.

S. R. NICHOLAS,
Acting Secretary for Railways.

Citrus Trees and Their Irrigation Needs.

(Concluded from Vol. 53, page 569).

R. J. BENTON, Special Fruit Instructor.

IN the first portion of this article, which appeared in the December issue, Mr. Benton discussed the decline that occurs in the health of citrus trees growing under the wide variety of soil and climatic conditions that obtain in the areas of the State where this type of fruit is planted. It was shown that in inland areas decline was always associated with the occurrence of excess soil moisture at some time in the growth of the tree, and root rotting due to the building up of the fungus Phytophthra by these conditions. Soil moisture requirements of citrus trees were discussed.

In this issue the author describes the application of irrigation water to the various types of soils used for citrus so as to ensure as nearly as possible the needs of the trees for moisture.

When to Irrigate.

The variability of rainfall does not ensure that the trees begin their spring growth without an irrigation. When the trees indicate that they are nearing the wilting stage, they should be watered. After the fruit is finally set, early in January, the trees may be actually subjected to a slight wilting. If a satisfactory crop is carried, the irrigation requirements of the trees must be closely observed, however, to ensure that satisfactory fruit size is produced. Where light crops are carried, longer periods between irrigations will result in the production of better sizes as well as better quality fruit. Longevity of trees and satisfactory production can only be obtained if trees are rather under- than over-watered.

The requirements of the trees for water may not coincide with fixed rotational periods of water availability, and the installation of facilities for irrigating independently of predetermined fixed periods could often be most helpful by ensuring irrigation at the optimum time of demand for water.

The Amount of Water.

No definite amount can be stated, as so much depends on the size of trees, type of soil, and permeability.

The purpose of applying water is to meet the trees' needs for nutrients in solution. The type of soil and its structure affect the amount of water any soil will absorb and hold. The root development of the trees is also influenced by these factors. In heavy soils generally, citrus tree roots are very shallowly developed, whilst in deep light, highly fertile sands and sandy loams, root growth will be much deeper.

Water should be applied to wet the soil to the depth of most of the roots. Penetration to a lower level is highly undesirable, and may even be dangerous to tree health. It means wasted water and some nutrients lost. A gradual building up in depth of free water-tables under the trees' roots may result, and a rise of injurious salts may be induced. This unused soil moisture cannot be readily removed, except through the action of roots of plants, unless costly new underground drains are installed, and these at times are not satisfactory. Consequently, a permanent water-table may be built up. Such wet conditions provide a favourable medium for root-rotting organisms, and if not corrected result in the only sound roots being forced to exist near the surface.

With variable soil types, difficulty arises in preparing the land so as to enable the objective of only wetting the root zone area being achieved.

In heavy loams, penetration will generally be slow, especially if the site is somewhat sloping. In lighter soils penetration is more rapid, especially so if grades are slack or nearly level. In instances such as these, the soil preparation to receive water will vary. In the case of soils with a slow penetration rate, breaking up the land by ploughing or some other form of tillage is usually necessary, whereas in the more rapidly permeable soil, non-tillage is likely to be most helpful in retarding penetration. If the surface of very permeable soils is tilled, some measure to consolidate the land or furrows will be necessary. In the latter cases, a higher head of water is essential to ensure rapid irrigation before over-deep penetration results.

An Independent Irrigation Storage in Azusa, California.
Holds sufficient to water lightly an area of 16 acres.

Method of Application.

Generally, there are only two methods of irrigation—through pressure as a spray, or by gravitation. It is immaterial which is used, and existing conditions usually determine the system adopted. In some sites and soils, irrigation by spraying is the only possible economic method. In most cases, however, irrigation by gravitation is used, application being made by furrowing or flooding over the surface of the land.

The objective should be to apply water as evenly as possible to the land and for penetration to be only as deep as the root zone of the trees. To attain this objective, it is usually necessary to make a trial on each soil type, and to select the most satisfactory method.

The type of soil, the grade or slope of the land, length of run and volume or head of water, are the most important factors to be considered in determining which method to adopt to ensure uniform depth wetting of the land. It is an advantage if these factors can be considered before the orchard is planted, because the rows of trees may be so arranged as to give the most suitable slope and length of run to attain even penetration of water.

Provided soils are readily permeable and the grades are slight without much sidefall to the block, flooding between banks in relatively short runs will most evenly wet the land, if a good volume or head of water is available. The banks may be fairly close together (in which case they are commonly called broad-based furrows), or the distance between them may be 10 feet or more. This is known as flood control—control being effected by the banks of earth.

In other cases from a few to many furrows may be used between the tree rows to carry the water. The method used, however, should be the result of noting how the water penetrates the soil, both in a vertical and lateral direction. Even after using any given method for a term of years, tillage of the soil may necessitate a change because of the penetration rate altering.

To facilitate attainment of a wider fluctuation in soil moisture for citrus trees, occasional irrigations may be given to only part of the land, such as in alternate furrows, broad based furrows and even in alternate lands between trees. This would be most desirable if irrigation was being applied before the soil moisture had reached a stage reflected in tree-wilting condition, say in early spring or late autumn, when transpiration and evaporation demands are not likely to be great.

Broad-based Furrow Irrigation at Yanco.

High Standard of Grading and Ditch Maintenance.

Ability to apply water as evenly as possible to meet the most exacting requirements of citrus trees in soils of great variability, further accentuated by the erratic demand for water, due to violent climatic fluctuations, obviously requires a high standard of soil grading and ditch maintenance if gravitational methods are used. Ditches must be not only free from obstructing weed growth, but well formed to deliver as high a head of water as possible to ensure a quick irrigation in permeable soils. Outlets from the ditch must be of ample size to allow a sufficient volume of water to fill the furrows or bays. The head of water must not be lost or wasted by using low

headlands. Headlands should be graded up and all low spots in the block should be filled in. Excess water in the form of run-off must be connected to an equally efficient surface drainage system, to which also should be directed any surplus water from earth ditches when irrigation is completed.

Efficient Control of Water is Necessary.

Control over the water during the application must be as complete as possible, if maximum results are to be obtained. The irrigating of very permeable soils by gravitation presents problems which are not likely to affect less permeable types. Permeable soils, therefore, should be irrigated under conditions offering a minimum of assistance to penetration. The use of narrow, V-type furrows is undesirable, and if broad-furrows or flooding are adopted, weed growth must be suppressed to prevent a retarded flow.

A newly broken rough soil surface will greatly influence penetration as compared with a more compacted, fine surface condition. A ploughed field, therefore, will usually admit water more readily than if the surface is disc cultivated, whilst least penetration results if the surface is undisturbed after the previous irrigation or rain has compacted the land.

Freshly-made furrows may be consolidated with advantage by cylindrical concrete blocks following the furrow-forming implement. If the length of run is rather long or the grade rather flat, the direction of water for part of the length of run through a limited number of furrows before using all the furrows intended, will be very helpful in attaining the desired result over most of the area. Some further control over supersaturation of the area as a whole is provided by a more frequent use of alternate furrows or "bays."

Where soil type variation is so great that very permeable conditions exist in the same run as less permeable soils, very little increased labour or trouble is involved in "by passing" the area occasionally or using a more limited number of furrows as indicated above.

With the spray system of irrigating, there is much greater control over depth of penetration, provided the length of spray line is not excessive. Irregularities, however, may occur due to variations in the size of spray orifices or using different types of nozzles and by foreign matter choking them. An efficient series of gauze strainers fitted in the pump sump, is essential to efficient spray irrigation.

Irrigation of Alternate Lands by the Furrow Method.

Summary.

Citrus fruits are grown over a very wide range of soil types, and under most variable climatic conditions.

In all soil types except the very deep, well drained sandy loams, decline of citrus tree health occurs.

Tree health decline is nearly always due to decay of fibre or larger roots by Phytophthora, resulting from excessive applications of water. Excessively wet soils may be general or, in isolated parts of blocks, largely depending on the type of soil and whether the land has been well or poorly graded.

Soil moisture is lost mainly by evaporation and transpiration of trees and plants. Evaporation and transpiration losses are greatest when temperatures are high.

Best production and longevity result from applying water only when tree condition indicates the need for additional soil moisture. Water should be applied by the most practicable method for the particular soil type, to ensure evenness in wettin the soil occupied by the citrus tree roots.

Deeper penetration by water is undesirable, and if occurring often, results in the creation of conditions very favourable to root decay and formation of a free water-table.

A soil auger should be frequently used to determine the necessary depth of penetration. An already wet subsoil condition prevents recognition of the penetration depth of subsequent waterings.

THE CUSTARD APPLE.

(*Concluded from Vol.* 53, *page* 524.)

H. W. EASTWOOD, H.D.A., Special Fruit Instructor.

THIS is the concluding portion of an article which commenced in the October issue and was continued in November. The previous sections dealt with such aspects as suitable soil and climatic conditions, and with cultural methods; this month the author discusses packing and marketing.

Picking and Packing.

Several pickings are necessary to harvest the crop, as the fruit matures over an extended period. Custard apples should be clipped and not pulled from the trees, the stalks being cut level with the shoulders of the fruit. If they are harvested when green, they wither and turn a bluish-black colour.

For distant markets the fruit should be firm enough to carry well and arrive on the market before it commences to soften. This means that it should be picked some days earlier than for local markets. Custard apples are not good shippers, and risks should not be taken in this regard. Fruit in a forward condition when picked often begins to soften four days afterwards, and if despatched to southern markets in this condition there may be heavy wastage.

Custard apples should be picked when the interstices between the corrugations of the fruit begin to widen and assume a creamy colour contrasted against the pale or yellowish green skin. At this stage the "bloom" on the fruit is at a maximum, and it will ripen very satisfactorily. It is essential to handle this delicate fruit carefully to prevent bruising and losses.

Local markets in nearby towns in reach of the place of production by road, only require, each week or two, small numbers of cases which contain an assortment of large and small fruit, and it has become the custom for growers to fill tropical cases with ungraded fruit of all sizes to supply this demand. A tropical case filled in this manner contains more fruit than three well packed half bushel cases.

Half bushel cases containing fruits weighing about 1 lb. with eighteen and twenty-one counts are usually the most popular lines on the southern markets. Smaller fruit ranging up to thirty counts is not as difficult to sell and generally brings a higher price than trays containing six large custard apples unless the latter are purchased for a special purpose.

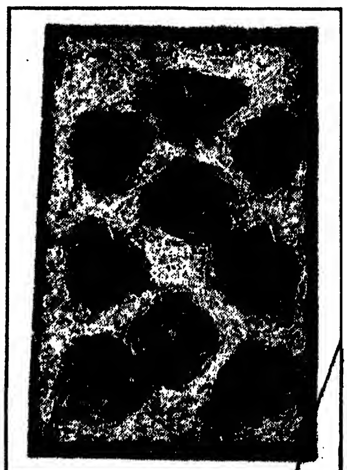
Size as a Separate Operation.

Packing will be simplified if sizing is first carried out as a separate operation. It is performed by hand and eye, and the fruit should be separated into three or four different sizes depending on the quantity to be packed. A bigger range between and within the sizes is necessary with custard apples than with such fruits as pomes or citrus. Whereas a variation of one-quarter of an inch is usually allowed in apples or oranges up to 1 inch is admissable in custard apples according to the shape of the fruit. Each heap of fruit can be separated into two different counts giving six to eight sizes when packing, provided there is sufficient fruit to adopt this practice.

During sizing any mealy bugs, which detract from the appearance of the fruit, should be removed by brushing carefully with a soft haired brush.

Use new clean cases and stencil them neatly with the growers' name and address and the number of fruit in the case. Paper the cases

Case Prepared with Woodwool before Packing.
Flat half-bushel—18 inches long x 11½ inches wide x 5½ inches deep.



Finished Case, with Top Layer of Woodwool Removed.
Note the padding between the fruit.

[*Queensland Department of Agriculture and Stock photos.*]

top and bottom; corrugated cardboard is even better than paper. A layer of woodwool is placed on the bottom of the case, between each layer and on top of the fruit. Custard apples should not be wrapped as this hastens the process of ripening.

Slight pressure on the lid is required in nailing down a correctly packed case. If the fruit is too low or otherwise loose in the case it will be damaged during the long rail journey. Fruit packed too high will be badly case marked and bruised on reaching its destination and, in either instance it will only sell at reduced market prices —if it is not unsaleable.

The dump half bushel case is the best container. When packing the larger sized fruits with eight, ten, twelve and fourteen counts, this case is best made up the narrow way, viz., 18 inches long by 7⅞ inches wide by 8⅝ inches deep. Smaller sized fruits (with fifteen, eighteen and twenty counts) will pack more satisfactorily in this case made up the wide way, i.e., 18 inches long by 8⅝ inches wide by 7⅛ inches deep.

Packs and Counts.

The following packs and counts are taken from the "Queensland Agricultural and Pastoral Handbook," Volume II, page 328.

NARROW CASE PACKS.

(18 inches long by 7⅞ inches wide by 8⅝ inches deep.)

Pack.	No. in Layers.	No. of Layers.	Total.
1 x 1	4	2	8
1 x 1	5	2	10
1 x 1	6	2	12
1 x 1	7	2	14

WIDE CASE PACKS.

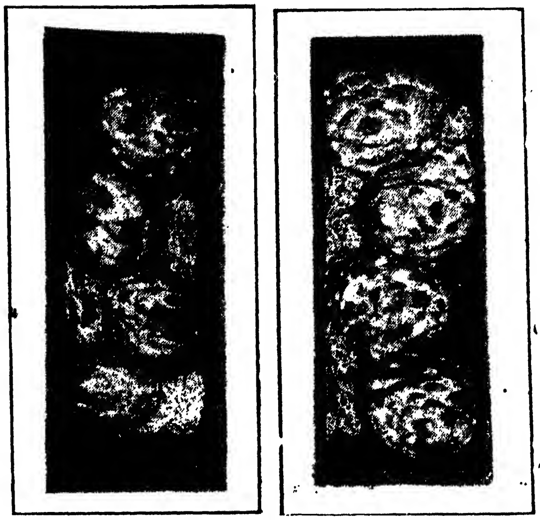
(18 inches long by 8⅝ inches wide by 7⅞ inches deep.)

Pack.	No. in Layers.	No. of Layers.	Total.
2 x 1	8 & 7	2	15
2 x 1	9	2	18
2 x 1	11 & 10	2	21

All these packs and counts may not be used by growers with small quantities of fruit. Larger counts than twenty-one to the case can be packed 2 x 1 with three layers. A single layer tray of a suitable depth is the most satisfactory for very large fruit, and this container is preferable for transport to distant or export markets.

The irregular shape of custard apples requires that common sense be used in packing the fruit snugly in the case; careful selection of awkward shaped fruits to match each other is a great help in obtaining a good pack. Do not unduly squeeze or force the fruit into position under any circumstances. The apex of the fruit usually softens first and most protection will be afforded to this part by placing the stalk of the fruit against the sides or ends of the case.

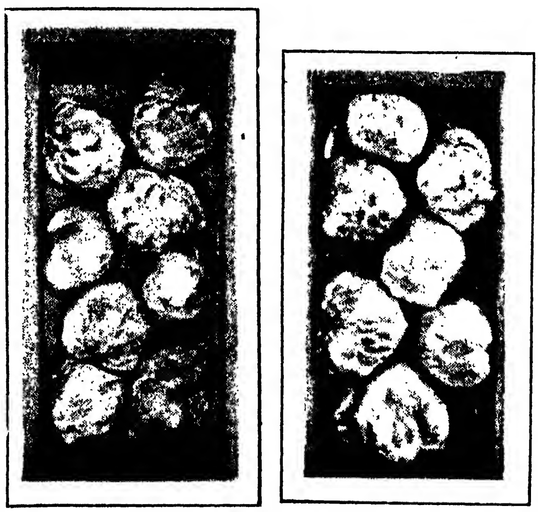
For interstate markets the grape case or flat half bushel (18 inches long by 11½ inches wide by 5¼ inches deep) used as a tray, is a good



Custard Apples Packed 1 x 1.

Left.—First layer. Four large fruit, 5 inches x 5 inches, and 2 lb. each in weight.

Right.—Second layer. Eight count in Australian half dump case made up the narrow way, *i.e.*, 18 inches long x 7⅞ inches wide x 8⅝ inches deep.



Custard Apples Packed 2 x 1.

Left.—Bottom layer. Fruit 4 inches x 4 inches and weighed 1¼ lb. each. Woodwool omitted to show placement of fruit.

Right.—Top layer. Fifteen count in Australian half dump case made up the wide way, *i.e.*, 18 inches long 8⅝ inches wide x 7⅞ inches deep.

container to hold a single layer of fruit. Pad the bottom, ends and sides of the case with wood wool. Place the fruit in position, leaving a small space between each fruit. Fill the spaces with woodwool which acts as a cushion between the fruits besides keeping them in position. A layer of woodwool is also placed on top of the fruit before nailing down the lid. The fruit should not be higher than the sides of the case before lidding and it should not move during transit. Two of these trays can be wired together for convenience and handling in transport.

Pests and Diseases.

There are no serious insect pests of the custard apple. Mealy bugs which mainly attack the fruit and congregate around the stalk end are the most troublesome. They can be sprayed with a mixture containing ½ pint of nicotine sulphate, 6 pints of white oil, 1½ lb. soap and 40 gallons of water. A solution of 1 lb. derris powder, 1 lb. soap and 32 gallons of water may also be used. This mixture should be freshly prepared.

Sometimes slight infestations of white wax, brown olive and pink wax scales are found on the foliage, but they disappear when the trees shed their leaves.

Collar rot is the only disease of economic importance, and it is fairly prevalent amongst custard apple trees; it does considerable damage if not detected in the early stages. It is advisable for growers to make at least a yearly inspection of all trees, but more particularly the older ones, for this disease. A convenient time to make this inspection is during pruning operations. The disease will be found on the lower portion of the trunk about ground level and also on the roots of the trees. The presence of gum on the butts of the trees is an early indication of collar rot. This disease will eventually kill the tree by ring-barking it unless remedial measures are applied. Treatment consists of removing the soil from the base of the tree and crown roots to expose the infected parts. Cleanly cut away all dead and decaying bark, paint the wound with Bordeaux paste and leave the treated portion exposed for some months.

Selected Citrus Buds.

The Co-operative Bud Selection Society, Ltd.

FOR some years it has been recognised that in most citrus groves there are trees that rarely produce sufficient fruits to be payable, whilst other trees are more constant producers of good quality and payable crops, so that with a view to enabling nurserymen to supply trees of the most productive and remunerative standards to planters, the above Society was formed under the aegis of the Department of Agriculture, and consists of representative fruitgrowers and nurserymen. The Society does not and cannot make profits, but merely exists to improve the fruit-growing industry by making available for budding selected buds from special trees of the best type of quality fruit and of reputed good bearing habit only. Trees from such buds should undoubtedly be more profitable and appeal to all progressive orchardists.

The Co-operative Bud Selection Society Ltd. supplied the following selected buds to nurserymen during the 1941 budding season, trees from which should be available for planting during the 1942 season :—

	Washington Navel.	Valencia Late.	Marsh Grapefruit.	Eureka Lemon.	Lisbon Lemon.	Emperor Mandarin.	Total.
Adamson, T., Ermington ...	4,000	4,000	...	2,000	...	...	10,000
Cambourn, H., Gosford ...	3,500	5,000	...	3,000	...	...	11,500
Catt, F. D., Carlingford ...	3,000	3,000	...	3,000	1,000	...	10,000
Eyles, A. T., Rydalmere ...	5,000	5,000	1,000	2,000	...	...	13,000
Ferguson, E. H., Wyong ...	1,000	1,500	...	500	...	...	3,000
Ferguson, F., & Son, Hurstville	2,500	2,500	...	...	...	...	5,000
McKee, Geo., Rydalmere ...	1,500	1,000	...	1,000	1,000	...	4,500
Rosen, L. P., & Son, Carlingford	10,000	15,000	2,000	5,000	1,000	800	33,800
Smith, W., Rydalmere ...	...	...	...	2,000	...	...	2,000
Spurway, F. E., & Son, Ermington	3,500	5,000	750	500	250	...	10,000
Swane Bros., Ermington ...	5,000	2,000	1,000	1,000	1,000	800	10,800
	39,000	44,000	4,750	20,000	4,250	1,600	113,600

Insect Notes.

A Contribution from the Entomological Branch.

General Principles of Insect Pest Control.

FROM time to time, inquiries received by the Entomological Branch indicate that some growers do not understand the principles underlying the control of insect pests. For their benefit the subject is discussed in some detail this month.

Broadly speaking, insects may be divided into two distinct groups, according to the manner in which they take their food, as follows:—

(1) Those which have biting jaws and chew holes in foliage, stems or roots of plants and take in solid particles of the food-plant. Included in this group are insects such as caterpillars, beetles, grasshoppers, etc.

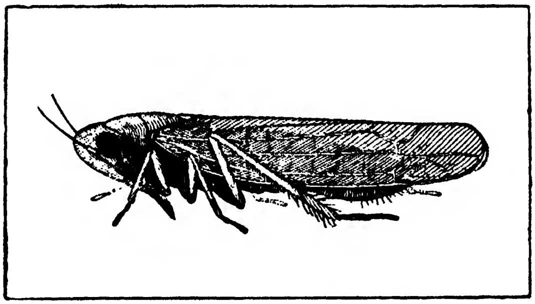
The Brown Vegetable Weevil.
Both the adult (upper) and the larva (lower) have biting jaws and take in solid particles of food.

(2) Those which have a proboscis or beak and puncture the plant tissues and suck up the sap. This group includes various kinds of plant-bugs, leaf-hoppers, aphids, scale insects, etc.

In general, stomach poisons are used for those insects with chewing mouth-parts and external contact poisons for those with sucking mouth-parts. It will be seen, therefore, that the correct identification of the type of insect causing the damage is of great importance, as it is useless and uneconomical to apply a stomach poison, such as arsenate of lead, for instance, to leaf-surfaces to control insects which only feed by sucking the sap.

Stomach Poisons.

Stomach poisons, depending upon which particular chemical is to be employed, are usually applied in the form of sprays or dusts or incorporated in baits. Stomach poisons commonly used include arsenate of lead, calcium arsenate, sodium arsenite, sodium fluosilicate, Paris green, etc.



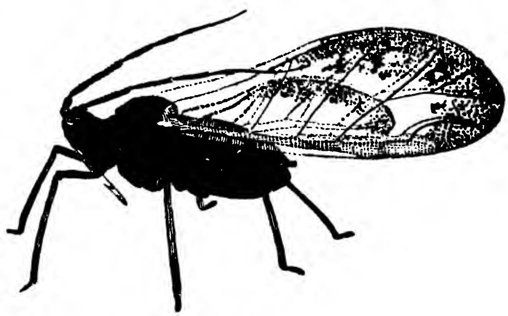
The Adult of a Leaf-hopper or Jassid.
A sucking insect.

External Contact Insecticides.

Contact insecticides are employed in the form of sprays or dusts and kill by their penetrating, irritating or suffocating action on the pests. Amongst the most commonly used contact sprays are red oil, white oil emulsion, nicotine sulphate, lime-sulphur, tar distillate and soda. The dusts include pyrethrum powder, nicotine dust, sulphur, derris dust, etc.

Application of Insecticides.

Contact insecticides as their name implies, must be applied so that they come into direct contact with the insects.



An Aphid.
Also feeds by sucking sap.

Stomach poisons, however, may be applied to the plants whether the insects are present or not at the time of application. When used in poison spray baits they are applied to areas where the insects are likely to find them, and when incorporated in bran baits, are usually broadcast over the ground where the insects occur.

Whatever insecticide is to be used, thoroughness of application is essential and a good spray or dust outfit is necessary for effective treatment. For large areas and orchard trees, power pumps capable of developing high pressures are recommended, but for small areas and for vegetable crop pests, various types of knapsack spray pumps and dusters may be used. For the home garden bucket spray pumps and small hand dusters are effective.

Fumigants.

Fumigants are sometimes employed to control both sucking and biting insects. Hydrocyanic acid gas is sometimes employed to control scale insects of citrus trees and carbon bisulphide, carbon tetrachloride, carbon dioxide, ethylene dichloride, etc., are used for the control of various pests of stored products and sulphur fumes are used to control bugs in houses.

Biological Control.

Biological control of insects may be described as the control of some particular insect, by means of either another insect or other animal which is parasitic or predaceous upon it. The following examples may be mentioned:—The woolly aphid of apple trees is largely controlled by an introduced minute wasp parasite which lays its eggs within the bodies of the aphids; the green vegetable bug is usually controlled by a wasp parasite which develops within the bug's eggs; useful ladybird beetles and their larvae, and the larvae of hover flies devour aphids or plant-lice; various scale insects are attacked by parasites and predators and lamellicorn beetles in certain parts of Australia are devoured by a toad which has been introduced to control them. Where biological control of any particular pest is thoroughly established it may almost, or completely, eliminate the necessity for artificial control of it by means of insecticides.

Other factors in insect pest control are clean cultivation, rotation of crops, etc.

Identification of Specimens.

Where growers are in doubt as to the particular type of insect causing damage, specimens should be forwarded for identification to the Department of Agriculture, Box 36A, G.P.O., Sydney. If possible a number of specimens should be forwarded together with a portion of the plant showing the injury. The specimens are best forwarded in a small box (not a match box) from which the living insects cannot escape, and sufficiently strong to withstand damage during transit. The name and address of the sender should be written clearly on the package.

Springtails.

(Collembola.)

SPRINGTAILS constitute a group of mostly small, delicate insects, the largest species measuring only about ⅛th inch in length. They are without wings in any stage of their lives, and their bodies are sometimes covered with scales or hairs. They vary greatly in colour, some being green or yellow, with irregular darker markings, others blue-black, red or banded, or with a metallic sheen.

The popular name of "springtail" has been applied to them, because most species bear a "spring," a pair of partly fused appendages at the end of their abdomens. The spring is folded beneath the body and the free end is placed into a small process. When suddenly released this enables them to take a quick leap into the air.

They live in the soil amongst decaying vegetable matter, or in moss, under leaves, etc.; some are found on the surface of ponds and others are plant feeders. Most species are harmless, but a few increase to such an extent, at times, that they may cause considerable injury to plants. Springtails often show a tendency to mass together in enormous numbers.

The minute spherical eggs, which are usually cream-coloured, are laid in small groups in the soil or amongst the humus where the adults may be feeding; the young, on hatching, resemble the adults in general form, but are much paler in colour. They grow by a series of moults.

There are several common species which inhabit garden soils, and after rain they may be frequently found floating in vast numbers on the surface of small collections of water. The commonest forms are white or grey species, which vary somewhat in size, but do not exceed more than one-tenth of an inch in length. They are particularly attracted to moist situations, and are found in decomposing wood, leaf-mould and most other forms of decaying organic matter, which is their normal food.

Common White Springtails.

They are often found feeding in various kinds of bulbs and corms in the soil, but generally in these instances some primary injury or disease condition, which may have provided additional moisture has first attracted the springtails from the adjacent soil and they are merely feeding

on the injured or rotting tissues. Under certain conditions, however, springtails may actually attack various kinds of seeds planted in the soil or destroy the growing tips of recently germinated seed, or even attack the more tender foliage of growing plants.

Control.

Where it is intended to plant seedlings, and the soil is known to be heavily infested with springtails, liming and frequent turning over of the earth before planting out will be found to reduce their numbers. If planted seeds or seedlings are being injured, the soil should be thoroughly watered with nicotine sulphate and soap solution used at the rate of—

Nicotine sulphate	1 fluid oz.
Soap	2 oz.
Water	4 gallons.

The liberal use of tobacco dust on the infested soil is also recommended.

Under certain circumstances a lime-sulphur spray (1 to 50) may be used to control springtails, but lime-sulphur at this concentration would injure the foliage of delicate plants.

Usually during summer, owing to the drier conditions of the soil, springtails become greatly reduced in numbers.

The Hay Itch Mite.

(Pediculoides ventricosus.)

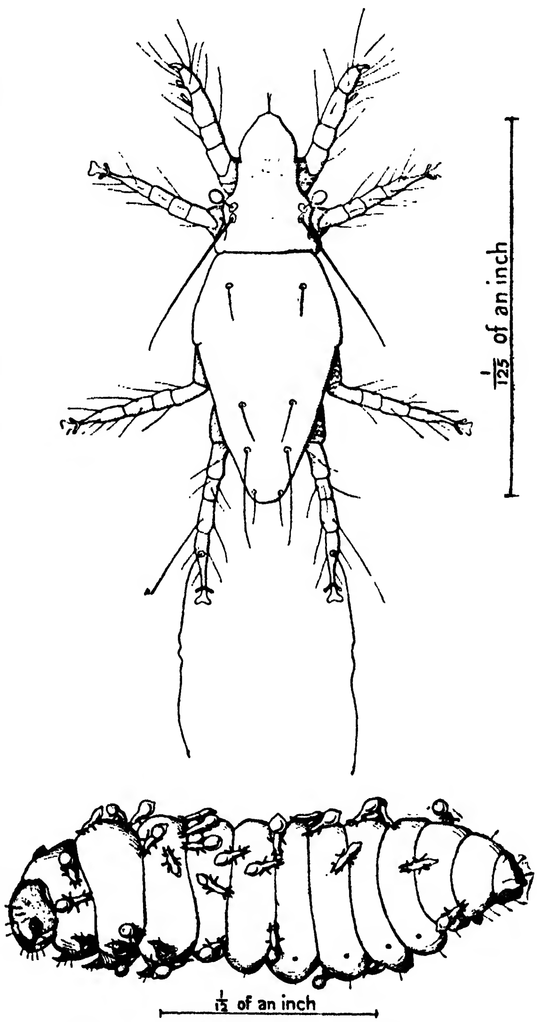
DURING the past few months persons who have used straw mattresses have complained of an irritating rash or itching swellings on their bodies. This condition has been caused by mites, which, on microscopic examination, have proved to be the cosmopolitan mite, known popularly as the hay itch mite.

At times, workers handling sheaves from stacks and sheaf exhibits kept from year to year, complain of being bitten; and stock feeding on infested chaff have been reported to be seriously attacked about the mouth and eyes.

This mite is an external parasite of insect larvae. Its normal hosts are the soft-bodied larvae of the common grain moth, and the larvae of grain weevils and other insects which are commonly found in stored grain products. The larvae of insects of various other groups are also attacked. An infestation of an apiary, in Queensland, in which the brood in nineteen of the infested hives died out, has been recorded by Veitch.[1] Although man is readily attacked, the mites do not feed for long on the human body and must feed on one of their normal hosts to complete their development.

This mite is very small, being only about 1/100th inch in length, but on feeding the abdomen of the female becomes very distended and the mite is then easily visible to the unaided eye.

A detailed account of the life history and habits of this mite has been published by Swan,[2] and in this article are mentioned a number of treatments which include the sprinkling of sulphur on working clothes to repel the mites and the taking of a hot bath as soon as practicable after handling of infested material. Another method suggested, which may prove of value, is cutting for hay at the earliest period possible. This will decrease the amount of grain in the stack and will reduce the development of grain moths and grain weevils, which serve as hosts of the mites.



Above.—Female Itch Mite.
Below.—Grain Moth Caterpillar Infested with Mites.
[*After Swan.*

[1].—VEITCH, R.—Annual Report, Dept. Agric. and Stock Q'ld., 1935-1936, p. 93 (1936).

[2].—SWAN, D. C.—*Jl. Agric. S. Aust.*, vol. 37, pp. 1289-1299, (1934).

Although it may be difficult to avoid having a certain amount of grain amongst the material after cutting, the use of straw containing quantities of ears should be avoided, as far as possible, for mattresses.

Where mite infestation is known to have occurred previously, and late cut crops are to be stored on the farm, the stack should be built on a new, clean site, well away from that previously used. In addition, all old or waste material and loose grain from the previous season, that is likely to harbour mites, should be thoroughly cleaned-up to prevent reinfestation.

Fumigation of a stack with carbon bisulphide has been found successful in controlling the mites, but this method is not considered to be generally practicable. Mites in bales of straw have been successfully controlled by vacuum fumigation with hydrocyanic acid gas.

The Storage Life of Canned Foods.

THE following is the text of a recent announcement, issued jointly by the British Ministry of Food and the Ministry of Health, in relation to the nutritional value and safety of canned foods.

Nutritionally, canned food compares favourably with cooked. In order to ensure good quality, articles to be canned are selected with care, and canned almost at once—before they have lost any of their nutritive value. Fruit and vegetables are often processed within a few hours of being picked. Processing, or sterilisation, is done with scientific care, and this results in less loss of nutritive value than when food is cooked on an open range.

Chemically, there is little risk of contamination from the tin of the can. Articles such as acid fruits, which might attack tin, are packed in lacquered cans which give a high degree of protection. Nowadays little or no solder is used to seal the ends of food cans, and there is no risk of it contaminating the contents.

Bacteriologically, canned food is less likely to be infected than fresh food. Not only is it handled less, as most of the preparation is done by machinery, but it is sterilised after having been packed into the can. Cans are carefully tested by the makers before release to ensure that sterilisaton and closure are perfect.

The Life of Certain Canned Foods.

The life of canned foods varies with the article, the presence or absence of suitable protective internal lacquer, and the humidity of the storage places. The last factor affects the external condition, since damp may lead to rusting and eventually to perforation. Cans are made from tin-plate, which is a pure steel sheet coated with pure tin.

Whenever a can of food is bought for storage, and not for immediate consumption, the date of purchase should be written in ink on the label.

Fruits.—One year is the usual time for the storage of canned soft or stoned fruits kept in a cool place. If kept longer, the food value of the pack is not impaired, but it may appear less attractive, and the natural acidity of the fruit may attack any scratched or otherwise damaged parts of the lacquer of the can.

Honey and Jam.—Should keep at least three years in lacquered cans.

Vegetables in lacquered cans store well for at least two years. If kept longer the appearance may become less attractive, but the food value remains unchanged.

Baked Beans in tomato or gravy do not deteriorate in appearance, and keep longer than two years.

Fish (especially sardines and salmon) keep for over five years as do most *Meat* packs (sausages, meat rolls, galantines, tongues, soups). Canned *Hams* present a special problem in food preservation, and the packers' guarantee is usually only six months. If, however, after longer storage, the can is not bulged, the contents are usually sound.

Condensed Milk keeps for varying periods according to the sugar content. Unsweetened milk keeps in good condition for about three years, and sweetened full cream milk remains unchanged for six to nine months, after which it may become sugary, but this slow crystallisation is in no way objectionable.

Dried Milk Powder may be sold in packets or cans. Its keeping quality depends on the amount of moisture and butter-fat which it may contain, and also on the method of packing. It should be used within a few weeks of receipt.

Damaged Cans.—A "blown" can may be detected from the fact that one or both of its ends will be bulged and cannot be pushed back to its normal position. A rust hole, puncture, or a defective lid is also a sign of danger.

All blown and leaking cans should unhesitatingly be discarded, and even if a can looks sound the contents should not be eaten if they have an unusual smell or colour.

Open Cans.—It is usual to turn the contents of a can into a glass or earthenware receptacle, but there is no health reason for doing so. Foods do not deteriorate more quickly in open cans than in glass. Cans of condensed milk, which, if not to be used all at once, are often opened by making two punctures in the lid, may be sealed by sticking two small pieces of paper over the holes by means of a drop of the milk. This will prolong the life of the contents.

* In unlacquered cans, however, corrosion of the interior of the open container may cause discolouration of the contents and an appreciable amount of tin contamination.

PARAGRAPHS AND NOTICES.

Heavy Sheep Losses from Shearing and Marking Wounds.

THIS year's marking and shearing have been noticeable for the many instances of heavy losses due to infection of wounds—the infection being called by many names, including malignant oedema, gangrene, septicaemia, blood poisoning, and black leg. Losses in some cases have been as high as 10 per cent. The main cause of such mortalities has been insufficient attention to cleanliness of instruments, sheds and yards during shearing and marking operations. This is well indicated by the fact that a prominent feature of a large proportion of the outbreaks has been the cessation of further losses when hygienic measures, advised by the Inspectors of Stock or Veterinary Officers investigating the outbreak, have been carried out.

These measures, advises Mr. Max Henry, Chief of the Division of Animal Industry, should include brushing down of all dust from walls and beams in sheds, thorough cleaning of the shearing boards, pens and chutes with hot, 5 per cent. caustic soda followed by a liberal application of some disinfectant such as chloride of lime, phenol, etc., cleaning of all shearing hand-pieces, removing all wool and surface soil from counting-out pens, marking with clean instruments with a bucket of disinfectant handy, using temporary yards for marking and dressing of severe wounds with a solution of an antiseptic. However, in view of the nature of the infection this last measure is probably the least important, the hygienic measures having by far the greatest effect in avoiding infection. The organisms that cause the disease are found mostly in dung and decaying animal matter, and so are present in greatest numbers where sheep have been concentrated, as in counting-out pens, old marking yards, etc. Deaths usually commence two to four days after shearing or marking and may continue for a week or more.

Appearance of the affected wound on dead sheep is typical; the surrounding skin is discoloured, crackling may be noticed when the area is pressed, and on cutting into the swelling there is a port-wine-like fluid which may extend for a considerable distance from the wound.

Superphosphate Affects the Germination of White Mustard Seed.

IN a mustard variety trial sown at Cowra Experiment Farm in May, 1942, the germination of white mustard (*Brassica alba*) was inferior on the area receiving 3 cwt. superphosphate per acre to that on a section in which this fertiliser had been inadvertently missed when commencing to sow the plots; the rate of seeding was 3 lb. per acre in drills 28 inches apart.

As a result of the above observations, some pot tests in a cold frame, and sowings in the open were made, which definitely indicated that where white mustard seed came into contact with superphosphate in the row, germination was affected. From these tests the following treatments were included in a final trial sown on 7th September, 1942:—

	Germination Percentage. (Average of Two Tests.)
Brassica alba **sown in open ground—**	
No superphosphate, control	78
1 cwt. superphosphate per acre	60
2 " " "	49
3 " " "	56

The superphosphate was spread in the bottom of the drills and thoroughly mixed with soil, seed sown and covered approximately ¾ inch deep. Plenty of moisture was available to promote rapid germination and seedling establishment, as the area was lightly watered daily until germination ceased and then twice a week to maintain seedling growth.

In another section of these tests where *Brassica alba* seed was in contact with superphosphate for four days and then sown with this fertiliser at the rate of 3 cwt. per acre germination dropped to 45 per cent.

From these results it would appear inadvisable to use more than 1 cwt. of superphosphate per acre when sowing mustard seed; however, where heavy dressings of fertiliser are considered necessary for this crop it would be advisable to drill the fertiliser into the soil three or four weeks before sowing the seed.—J. N. WHITTET, H.D.A., Chief Agrostologist.

SORGHUM should not be fed to stock until it comes into head; if fed prior to this stage there is a danger of what is commonly known as sorghum poisoning. The greatest yield of green fodder is obtained when the seed has formed and is still in the milky stage; at this stage the crop is very palatable and digestible.

In feeding sorghum to stock it is only necessary to adopt certain precautions to avoid loss. The poisonous substance gradually diminishes as the plants become older, and entirely disappears by the time the seed is formed. Stock should not be allowed to eat young sorghum, ecpecially if it is wilted through dry, hot weather.

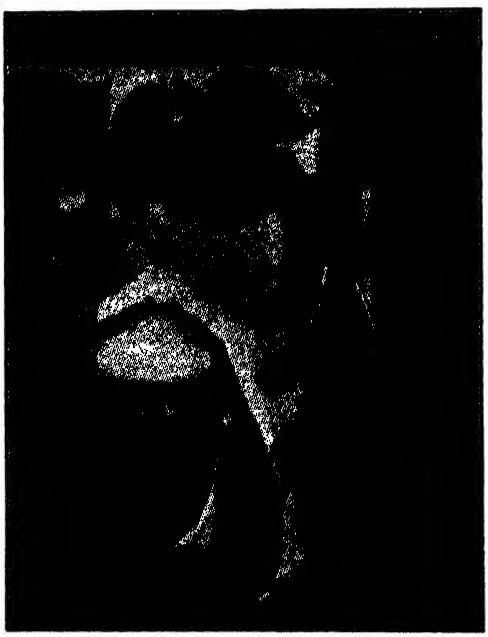
Vegetable Seed Areas Allotted to N.S.W.

THE demand for vegetable seed is expected to increase steadily, and the fullest co-operation of New South Wales farmers in this vital branch of production is asked for by the Commonwealth Vegetable Seeds Committee. At a recent meeting for the discussion of the summer production programme for 1943-44 it was decided to allot to this State the acreages indicated in the accompanying table. This quota, it is pointed out, is considerably greater than that for last year, and a determined effort will be necessary if it is to be met.

Crop.	Acreage in N.S.W.	Contract Price.	Percentage of each Variety.
Beet (Red)	46 acres	Transplanted, 4s. per lb. Non-trans., 3s. per lb.	38% Detroit and similar Globe types. 50% Early Wonder. 12% Egyptian Turnip Rooted.
Beet (Silver)	5 acres	2s. per lb.	45% Fordhook Giant. 25% Lucullus. 30% Large Ribbed Dark Green.
Cabbage	16 acres	10s. per lb.	55% Succession. 17% Copenhagen Market. 12% Enkhuizen Glory. 16% Early Drumhead (Fottler's Brunswick).
Carrot	101 acres	8s. 6d. per lb.	80% Red Cored Chantenay. 20% Danvers Half Long.
Cauliflower	8 acres	3 Months and Nugget type, 40s. per lb. 4 Months, 32s. 6d. per lb. 5 Months, 30s. per lb. 6 Months, 25s. per lb.	35% 4 Months Australian type. 15% 5 Months type. 50% 6 Months type.
Parsnip	11 acres	3s. per lb.	100% Hollow Crown.
Swede Turnip	92 acres	Non-trans., 2s. per lb.	100% Purple Top type.

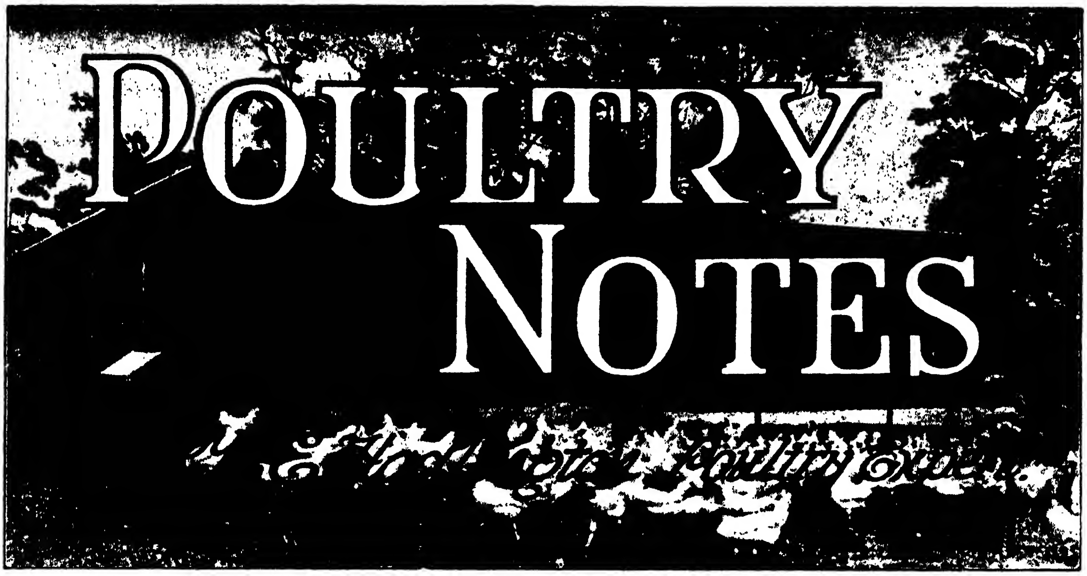
Conformation and Production are Closely Related.

FOR some years past Scottish farmers interested in dairying have copied the Americans in advocating "100,000-lb. cows." By this term they mean cows which have given 100,000 gallons of milk in their lifetime. To do this, as a rule, they must have successfully completed ten lactations, averaging 1,000 gallons each time. Such an objective requires that some consideration be given to the relationship of conformation to production, and the animal must have constitution.



Professor A. D. Buchanan Smith, of the University of Edinburgh Institute of Genetics, makes the interesting statement that "the legs and feet of a dairy cow are as important as the udder." Study the accompanying photo. and think how typical it is of the cow you have known to be a heavy milker, and one whose udder has remained sound through years of production.—C. G. F. GRANT, Herdmaster.

Talking Will Not Win the War. It May Lose It.

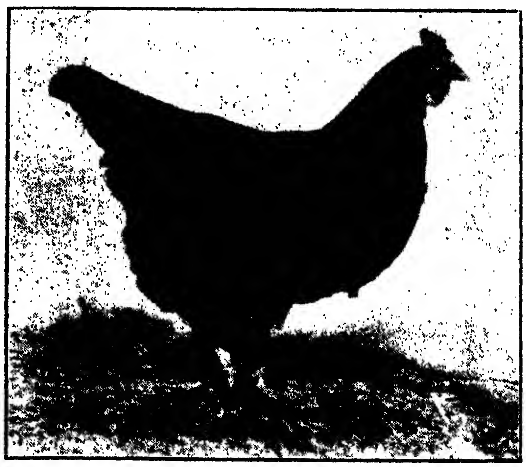


PROVISION OF GREEN FEED.

ON the majority of poultry farms less green feed is grown, even in normal seasons, than could be fed to advantage. An abundance of green feed is not only of value in maintaining the health of the birds, but it effects a saving in the feed account. If the good rains experienced over the past few months continue, an early start should be made to prepare for growing any additional crops. While it might be difficult under present conditions, owing to shortage of labour, to grow as much as might be desired, every effort should be made to put in crops.

Of the crops which can be grown in the autumn, Berseem clover stands alone; it can be sown either in drills, as in the case of lucerne, or broadcast. To attain the best results, however, the seed should be sown during February or early March. If properly established and kept watered this crop will provide a good supply of greenstuff right through from May until October and sometimes a little later if weather conditions are favourable. However, most of the seed of this clover is imported from Palestine, and it is probable that difficulty will be experienced in obtaining supplies this season. In the event of Berseem clover seed not being available, other crops which will provide green feed during the winter months are barley, oats, wheat, rape, silver beet, etc., all of which can be sown between February and May.

Although Berseem clover is so satisfactory over this period, it has to be borne in mind that it is only an "annual," and for



First Hen to lay 200 Eggs in 1942-43 Competition.
The "Poultry Newspaper" Special Prize of £3 3s. for the first hen to lay 200 eggs in the Hawkesbury College Competition was won by Mr. R. D. Wilson, whose hen laid 200 eggs in 228 days.

this reason the "old favourite," lucerne, which can be relied upon to last for about seven years, even in the County of Cumberland, should form the major crop on

poultry farms. In most cases, lucerne can be cut during the greater part of the year, but does not grow so quickly during the coldest months of winter.

The best time of the year to sow lucerne is from March to the early part of May, but failing this period it can be sown in September provided that the land is properly worked and free from weeds.

Methods of Feeding Greenstuff.

In cases where an abundance of green feed is grown, it can be finely chaffed and up to one-third by measure included in the morning mash, in place of most of the bran. In addition, about ½ oz. per bird can be fed separately during the day; in the summer this should either be fed in troughs, in the houses, or be given late in the afternoon after the grain feed. It is useless to leave greenstuff exposed to the hot sunshine, as it becomes dry in a short time and much is wasted.

If only sufficient is grown for feeding direct to the birds, it will usually be found that one hundred adult birds will consume 10 to 12 lb. per day; if they will eat more, extra can be given.

Management of Pullets.

Despite the advice frequently given in these "Notes" regarding the handling of pullets during the summer, there are still many poultry-farmers who transfer them in large numbers to the laying quarters before the end of the summer. This practice leads to many of the birds moulting and is frequently responsible for outbreaks of catarrh.

It should be realised that young stock are prone to crowd together on the perches, and if large numbers are placed in a house they swelter on hot nights, and this does the damage. If it is necessary to transfer pullets to the laying pens before the cool weather of the autumn commences, the best course is to put not more than 100 together, no matter how large the house, and to see that the perches are not less than 20 inches apart.

However, if at all possible, the pullets should be kept in colony houses until the autumn, particularly those hatched late in the season, as young birds are more susceptible to infection by disease than older ones and the laying pens are usually not spelled before transferring the pullets.

Culling Unthrifty Birds.

During this month and next is a good time to look over the young stock to eliminate unthrifty birds, as any chickens hatched by the end of September should be showing good size and condition if they are to be worth keeping.

Chickens which have had a setback during the early stages of rearing and are still miserable and unthrifty, are better culled before they consume any more food, as they will never develop into payable birds.

Re-grassing Bare Runs.

For the information of those who did not see the particulars published in these "Notes" in 1941, of an experiment in the re-grassing of runs, carried out at the Government Poultry Farm, Seven Hills, the results are repeated here. Two large colony runs of half-acre each were sown with pasture grasses early in June, which was rather late but necessary because of the dry weather conditions earlier. In one run a mixture of 12 lb. Italian Rye and 3 lb. Red clover to the acre was sown, and in the other the same quantities of Perennial Rye and White clover as recommended by the Agrostologist of the Department. By September both crops had made such good growth that it became necessary to cut them for green feed. The extent of the growth is shown in the accompanying illustrations.

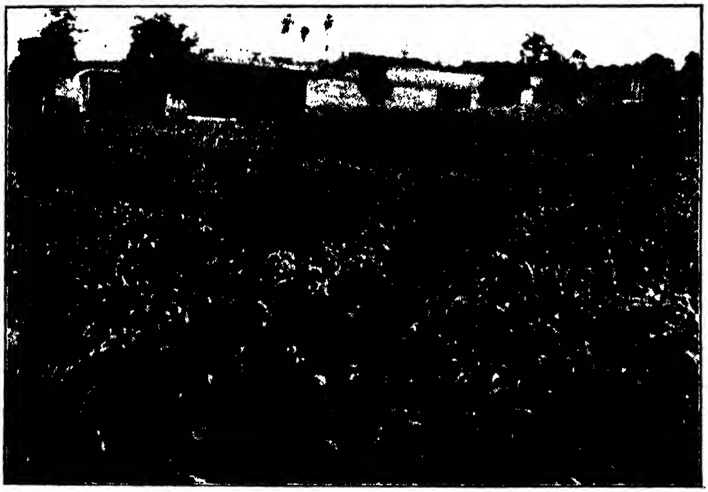
About the end of September, 200 young pullets were placed in the runs and remained in them right through to April. Owing to the dry summer the runs became denuded of all growth, and it appeared that further planting would be necessary, but before the runs were required in September, 1942, they were again practically covered, mainly with the Rye grasses.

Those who are able to undertake the re-grassing of runs will find that the Perennial Rye and White Clover mixture will, under reasonably good conditions, be somewhat more permanent than the Italian Rye and Red Clover. Both crops should be sown between March and the end of

May; it is during this period that the birds are usually moved from the colony pens, and in such cases the runs would be spelled for several months ready for the chickens in the spring, thus allowing time for the crops to grow.

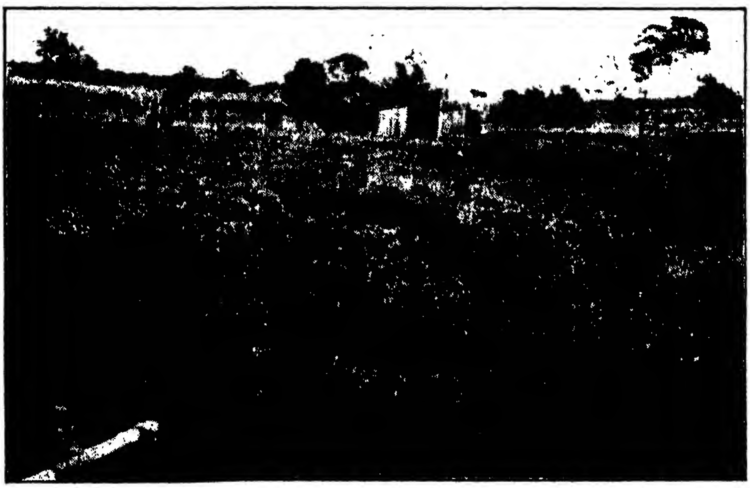
When sowing these grasses the surface of the ground should only be lightly cultivated—just sufficient to enable the covering of the seed.

Another satisfactory grass for covering bare runs is Kikuyu, but as it does not seed, it has to be grown from roots, and these



Left :

Italian Rye Grass and Red Clover 3½ Months After Sowing.



Right :

Perennial Rye Grass and White Clover Sown at the Same Time.

are usually spaced about 12 to 18 inches apart. The planting can be done in the early autumn, spring or early summer. Kikuyu spreads rapidly by runners and can be cut for green feed when the growth is excessive. Heavy frosts will cause the grass to become browned, and in extremely dry seasons it might be killed off by overstocking in the summer, but it will withstand severe conditions as well as most other grasses.

Control of Red Mites.

All through the summer it is necessary to be on the alert for an infestation by red mites, as these parasites can cause much loss of production and lower the resistance of the birds. Some beginners are misled by the name "red mite," and, in looking for red parasites, miss those in the grey or

white stages, with the result that the houses become heavily infested before the farmers realise that mites are present.

An occasional check over of the perches or nests will indicate whether an infestation by this pest is commencing, and if mites are found the perches should be painted with wood preserving oil and the nests sprayed with kerosene emulsion. Should the mites be found in the walls of the houses, two or three applications of the same spray at intervals of three or four days, according to the degree of infestation, will be found effective in controlling them. In spraying the houses it is necessary to penetrate all crevices where the mites could harbour, both inside and outside; also the floor and possibly the roof. In the case of iron walls the spray must reach the laps where the parasites can secrete themselves.

Poultry farmers should not delude themselves by thinking that iron houses do not require as much attention as wooden ones. The only difference is that those built of iron can be sprayed more readily.

For small farms a stirrup pump with about 10 feet of hose for one operator, or 20 to 30 feet for two persons, is suitable for spraying, but on large farms a 40-gallon cask or drum fitted with a force pump will meet requirements.

How to Make the Emulsion.

It is essential that the emulsion be made correctly, otherwise it will not be effective. The right method is to dissolve, in 1 gallon of boiling water, ½ lb. of soft soap or finely cut household soap; then add slowly, stirring briskly all the time, 1 gallon of kerosene.

To ensure that the mixture is thoroughly emulsified it is a good plan to pass it through a spray pump back into the container, continuing this procedure for several minutes.

The 2 gallons of mixture thus made is the "stock" emulsion and to make the spray mixture it should be added to 8 gallons of hot or cold tap water and stirred thoroughly for a few minutes. It is also advisable to stir the spray occasionally while using.

If all the stock is not required at one time, it can be kept for future use, but it forms into a jelly, when cold, and it is necessary to re-heat it before use, or add hot water to dilute it.

If made and used in accordance with the directions outlined, there is no doubt about the effectiveness of this spray for red mites and ticks, and the cost is very low—2 gallons of kerosene and ½ lb. of soap will make 10 gallons of spray.

Care in Use of Wood Oils.

When using wood oils for painting perches and nests, care should be taken that the birds do not come into contact with the wet surfaces, as some oils have a burning effect upon the skin of the comb, wattles, or face of the birds which results in injury and loss of production.

A number of cases have come under notice where birds have been affected with a dry scaly condition of the combs and wattles which has been traced to this cause.

The best course is to treat the perches early in the morning and remove them from the pens until late in the afternoon. In the case of nests, it would, of course, be necessary, where the pens are occupied, to provide other nesting facilities, and the treated nests should not be replaced until thoroughly dry. Thus spraying with kerosene emulsion is more satisfactory where duplicate nests are not available.

THE ENEMY LISTENS.

Don't let the Fighting Services down by passing on secret information in your possession.

GUARD YOUR TONGUE.

Brucellosis-free Herd Scheme (Swine).

LIST OF ACCREDITED HERDS.

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Adams, J. P., "Melton," Daysdale.
Bathurst Experiment Farm, Bathurst.
Boardman, C., Camden.
Campbell, D., Hillangrove, "Wamberal," via Gosford.
Chapman, G. E. and Son, "Illabo Park," Alectown.
Cocks, F. D., "Condalarra," Gooloogong.
Cowra Experiment Farm, Cowra.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., "Glengar," Capertee.
Farrer Memorial Agricultural High School, Nemingha.
Foley, Mrs. E., Bligh Stud Piggery, Water Lane, Rouse Hill.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Holland, A. L., Argonne, Tubbul.
Hurlstone Agricultural High School, Glenfield.
Maybin, N. C., Towac, Orange.
McCaughey Memorial Agricultural High School, Yanco.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Riverina Welfare Farm, Yanco.
Government Agricultural Training Farm, Scheyville.
Shirley, G. F., "Camelot," Penrith.
Smith, J. M., Eulo Glen, Urana.
Stewart, Sir Frederick, "St. Cloud," Dundas.
Wagga Experiment Farm, Bomen.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., "Gwandalan," Grenfell.
Wilson, A. G., Blytheswood, Exeter.
Wollongbar Experiment Farm, Wollongbar.

Herds Other than Registered Stud Herds.

Bathurst Gaol, Bathurst.
Berry Training Farm, Berry.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Croft, H. M., "Salisbury Court," Uralla.
Glen Innes Prison Camp, Glen Innes.
Gosford Farm Home for Boys, Gosford.
Goulburn Reformatory, Goulburn.
Kenmore Mental Hospital, Kenmore, via Goulburn.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital, Orange.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital, Parramatta.
Peat and Milson Islands Mental Hospital, Hawkesbury River.
Pollak, V., Marata, Harrow Road, Glenfield.
Smith, C. W. J., "Norbiton," Canadian Lead.
Stockton Mental Hospital, Stockton.
Waterfall Sanatorium, Waterfall.

Abortion-free Herds.

THE following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion-free :—

Owner and Address.	Number in herd.
Bathurst Experiment Farm (Ayrshires)	24
Bauerle, P. A., Holbrook	9
Bush, W., Ben Lomond	18
Callan Park Mental Hospital (Aberdeen Angus) ...	41
Carrick, G., "Clonlea," Central Tilba	37
Cowra Experiment Farm (Ayrshires)	71
Department of Education—Farm Home for Boys, Gosford	36
Dixson, R .C., "Elwatan," Castle Hill	24
Edwards, G. M., "Rothwick," Uralla (Jerseys)... ...	4
Fairbridge Farm School, Molong	93
Farrer Memorial Agricultural High School, Nemingha	35
Forster and Sons, Abington, Armidale (Jerseys) ...	265
Forster, N. L., Abington, Armidale (Aberdeen-Angus) ...	188
Grafton Experiment Farm (Aberdeen-Angus)	20
Grafton Experiment Farm (Australian Illawarra Shorthorns)	93
Hawkesbury Agricultural College, Richmond (Jerseys)...	108
Hicks A. A., Estate, Culcairn	52
Hill, E. Pritchard, Bowling Alley Pt. (Jerseys) ...	96
Hordern, E. D., Cabramatta (A.I.S.)	95
Hurlstone Agricultural High School, Glenfield	39
Killen, E. L., "Pine Park," Mumbil	223
Leitch, J. F., "Tunbridge," Merriwa (Aberdeen-Angus)	48
McEachern, H., Tarcutta (Red Poll)	9
Martin Bros., "Narooma," Urana-road, Wagga ...	125
Morisset Mental Hospital	80
Navua Ltd., Grose Wold, via Richmond (Jerseys) ...	132
New England Experiment Farm, Glen Innes (Jerseys)	97
New England University College, Armidale	16
Peel River Land and Mineral Co., Tamworth	82
Reid, G. T., "Narrangullen," Yass	171
Robertson, D. H., Scone	82
Rydalmere Mental Hospital, Rydalmere	57
Salway, A. E., Cobargo	95
Skinner, D. S., "Wyworrie," Ben Lomond	38
Smith, Jas. C., Ben Lomond	66
Stewart, Sir Frederick, "St. Cloud Stud," Spurway-street, Dundas	9
Trangie Experiment Farm, Trangie	88
Wagga Experiment Farm, Bomen, N.S.W.	81
Walker, Jas. R., "Strathdoon," Wolseley Park ...	32
White, F. J., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	137
Williams, Chas., Ben Lomond	27
Young, A. H., "Rock Lynn," Cudal (Polled Beef Shorthorns)	7

MAX HENRY, Chief of Division of Animal Industry.

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

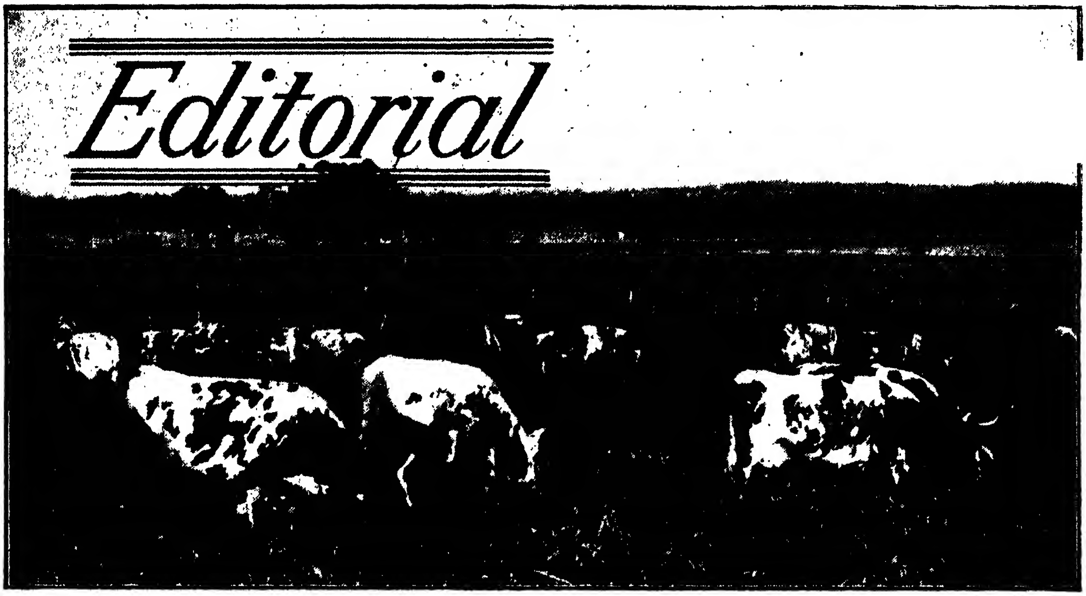
Owner and Address.	Number Tested.	Expiry Date.
		1943.
F. and C. Ryall, 5 Western Avenue, West Wollongong	57	1 Jan.
Wollongbar Experiment Farm	112	4 „
J. I. Toohey, "Mandemar," Berrima	56	8 „
W. J. Stephenson, "Hill View," Fig Tree	23	10 „
W. C. Wyatt, Sherwood Road, Merrylands	29	12 „
Hawkesbury Agricultural College, Richmond (Jerseys)	128	18 „
E. L. Killen, "Pine Park," Mumbil	201	20 „
C. Brownlaw, Gol Gol	34	26 „
Hurlstone Agricultural High School, Glenfield	33	26 „
W. W. Martin, "Narooma," Urana Road, Wagga	150	29 „
A. G. Wilson, Exeter (Jerseys)	68	29 „
McGarvie Smith Animal Health Farm, Liverpool	65	1 Feb.
The Sydney Church of England Grammar School, Moss Vale	55	6 „
Tudor House School, Moss Vale	17	6 „
Koyong School, Moss Vale	2	6 „
New England Girls' Grammar School, Armidale	25	6 „
A. E. Stace, Taylor Street, Armidale	31	7 „
A. C. O'Dea, Perry Street, Dundas	28	19 „
New England University College, Armidale	13	1 Mar.
W. Boland, "Seaton," Inverell	9	1 „
Parker Bros., Hampton Court Dairy, Inverell	105	1 „
A. D. Frater, King's Plain Road, Inverell	106	1 „
Lunacy Department, Parramatta Mental Hospital	31	6 „
Trangie Experiment Farm, Trangie	138	19 „
Emu Plains Prison Farm	100	20 „
Lunacy Department, Morisset Mental Hospital	80	25 „
R. C. Dixon, Elwatan, Castle Hill (Jerseys)	23	3 April.
St. Michael's Orphanage, Baulkham Hills	18	5 „
Liverpool State Hospital and Home	102	10 „
F. C. Harcombe, Hillcrest Farm, Warialda Road, Inverell	32	15 „
Grafton Experiment Farm	190	17 „
K. W. D. Humphries, "Karoola," Muswellbrook	162	24 „
H. F. White, Bald Blair, Guyra (Aberdeen Angus)	137	26 „
Berry Training Farm, Berry	162	31 „
S. E. E. Cohen, Auburn Vale Road, Inverell	23	12 May.
B. N. Coote, Auburn Vale Road, Inverell	53	14 „
J. De Ville, Inverell	10	15 „
A. N. De Fraine, Reservoir Hill, Inverell	22	15 „
Sir F. H. Stewart, Dundas	6	30 „
Cowra Experiment Farm	41	27 June.
P. M. Burtenshaw, Killean, Inverel	31	27 „
		1943.
A. E. Liggins, "St. Leger Dairy," Kuring-gai Chase Road, Turramurra North	52	7 July.
Kahlua Pastoral Co., "Kahlua," Coolac	314	10 „
Lunacy Department, Rydalmere Mental Hospital	65	30 „
W. J. Frizelle, Rosenstein Dairy, Inverell	76	1 Aug.
W. Budden, "Hunter View," Kayuga Road Muswellbrook	18	7 „
T. McLane, Wellingrove, Inverell	33	10 „
W. Willis, "Rosedale," Inverell	17	13 „
A. Hannaford, Braidwood	20	26 „
W. S. Grant, Braidwood	20	26 „
J. McKenzie, Inverell	35	28 „
Farrer Memorial Agricultural High School, Nemingha	39	29 „
The William Thompson Masonic School, Baulkham Hills	50	29 „
Navua Ltd., Grose Wold, via Richmond (Jerseys)	113	4 Sept.
Australian Missionary College, Cooranbong	113	8 „
Department of Education, Gosford Farm Home	40	29 „
A. L. Logue. "Thornbro," Muswellbrook	46	13 Oct.
Woomargama Estate	207	22 „
Barnardo Farm School, Mowbray Park	75	4 Nov.
State Penitentiary, Long Bay	10	9 Dec.
		1944.
Limond Bros., Morisset	60	13 Jan.
Department of Education, Yanco Agricultural High School	69	6 Feb.
Riverina Welfare Farm, Yanco	74	6 „
C. Wilton, Bligh Street, Muswellbrook	75	3 Mar.
N. L. Forster, Abington, Armidale (Aberdeen Angus)	188	12 „
Forster and Sons, Abington, Armidale (Jerseys)	87	13 „
Wagga Experiment Farm (Jerseys)	81	20 „
St. Ignatius College, Riverview	25	27 „
Lunacy Department, Callan Park Mental Hospital	26	1 May.
T. J. Wilks, "Oaks Farm," Muswellbrook	37	5 June.
New England Experiment Farm, Glen Innes (Jerseys)	73	27 „
G. T. Reid, "Narrengullen," Yass	274	3 July.
Farm Home for Boys, Mittagong	49	9 „
St. Vincent's Boys' Home, Westmead	26	20 „
Lidcombe State Hospital and Home	106	30 „
Ehsman Bros., Inverell	28	13 Aug.
Peel River Land and Mineral Co., Tamworth (Beef Shorthorns)	82	28 „
Bathurst Experiment Farm	24	9 Oct.
Lunacy Department, Gladesville Mental Hospital	34	23 Nov.

Tubercle-free Areas.

The following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis :—

Bombala Area.
Inverell Area.
Braidwood Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

MAX HENRY, Chief of Division of Animal Industry.



The Agricultural Gazette.

February, 1943.

POST-WAR NEED

For Agricultural Committees.

THE war is doing disturbing things to farming, but it is imperative that what is happening should be viewed as dispassionately as possible by those affected and with the fullest appreciation of the merits of the changes. Many, of course, are temporary expedients, not to be tolerated any longer than is necessary; others, it must be admitted, represent long overdue advances in the industry.

Most notable of these is the formation of district agricultural committees, in which must be recognised not merely a contrivance to tide farming through a crisis, but machinery ideally suited to its needs in time of peace.

Thoughtful farmers are perceiving that the difficulties through which primary production is now passing are doing much to fit it for post-war developments and strains. Labour and other problems, it is being realised, are broadening farmers' experience and outlook, and inclining them to look more critically at many outworn methods and conventions. Closer contact, moreover, is resulting in a better understanding between farmer and farmer, and between the farmer and his cousin in country town and city, and understanding means goodwill.

It would be unreasonable to expect farmers immediately to adjust themselves to the radically changed conditions governing their operations, especially as to labour, but there is increasing evidence of such adjustment. There is a growing sympathy, for instance, with the group farming idea (after all, to help in extremity is not such a strange idea to the rural Australian), and there is an increasing demand for the labour organised by district agricultural committees.

Excellent work is being done by the committees in every part of the State in the efficient mobilisation of rural communities.

VOLUNTEER LABOUR HELPS WITH POTATO HARVESTING.

HEAVY yields and shortage of experienced potato diggers combined to make the harvesting of this season's potato crop very difficult. In fact, several weeks ago it was claimed that only portion of the crop would be lifted in some districts. Reports, however, are now coming to hand daily telling how district and local war agricultural committees have helped potato growers to solve their harvest labour problem.

Farmers have been encouraged to pool their labour and machines, and townspeople have been organised into groups for week-end and holiday farm labour. In many centres every section of the community has fallen into line. Business houses at Dorrigo, for instance, agreed to close early on certain days to allow their employees the full benefit of the long afternoons for potato harvesting. The local barber and the bank manager are joint secretaries of the Dorrigo volunteer land army. The recruits include all walks of life; the local doctor, the parish priest and Methodist minister, the chemist, the storekeeper and the garage proprietor.

The most satisfactory aspect of the reports to hand regarding volunteer labour is that, with a little initial guidance, this type of labour did the job expeditiously and well.

A Science Liaison Bureau.

A COMMONWEALTH Science Liaison Bureau has been set up by decision of War Cabinet. The Bureau is associated for administrative purposes with the Department of War Organisation and Industry. It has offices in Melbourne and Sydney, and will later have agencies in other cities. The Deputy-Director for New South Wales is Mr. A. R. Penfold.

The Bureau has two main purposes. The first is to ensure that in the war effort full use is made of the scientific work already carried out by such bodies as the Council for Scientific and Industrial Research, universities and industrial laboratories. The second purpose is to locate scientific problems bearing on the war and to direct them into appropriate channels.

Provided the new Bureau remains largely liaison in character it should do a good job for the nation by bringing the scientific resources of the Commonwealth within easy reach of the services, Government Departments and war industries, and by co-ordinating scientific inquiries which spread over several departments. If, on the other hand, it becomes a bottle-neck through which all scientific information bearing on the war must pass, it will give rise to much delay and dissatisfaction.

Assurance has been given that this will not be the case. It is the stated aim of the Science Liaison Bureau to add to, and not to replace, the many close contacts which already exist between Government Departments and scientists.

Through its liaison officers the Bureau hopes to establish personal contact with many members of the services and Government Departments. If any technical problem is brought to the notice of these liaison officers or of the Director, the Bureau will immediately discover whether any work has already been done on the problem, whether it has arisen elsewhere, who can give authoritative advice on it; and if a scientific investigation is necessary and practicable the Bureau will undertake that responsibility and finance the investigation.

The Bureau will shortly publish a directory of scientific resources for use in the services, Government Departments and war industries. It will also publish other leaflets bearing on the enlistment of science for war.

Youth Plays its Part on the Food Front.

IN Britain, as in Australia, youth has played and is still playing a grand part in assuring the nation's food supply.

The eagerness and goodwill with which the tens of thousands of Britain's youthful land army—there were 20,000 schoolboys alone working in it—tackled the harvesting operations, helped materially to save a most difficult situation brought about by two coinciding factors—a rich and abundant harvest and a shortage of farm workers.

The armed forces naturally drew heavily on the farm workers of England and Scotland. But boys and girls from the bombed cities, who up to a year or so ago had no acquaintance with the countryside, evacuees whose parents are in the armed forces or in war industries, sturdy children born and reared on the land, and boys and girls from the schools in towns took over their share of the work in the hopfields of Kent and the fruit orchards of the Southern Counties and West of England.

The Ministry of Agriculture and the Board of Education who between them originated the scholar-harvester nation-wide plan ensured that a fair balance was kept between the need of farm labour, the children's keenness to supply it and the vital necessity that education should not suffer. War Agricultural Committees acted as liaison officers between the farmers and the schools, deciding where the need of labour was most urgent and determining with the schoolmasters how many scholars should be sent to certain places. They settled the hours of work, which are limited by government decree, and arranged the children's housing in large country houses, village halls, camps and hostels.

As it had been ruled that the supervision of farm work by the farmers did not relieve teachers and the school authorities of their responsibility for the safety and well-being of children in their charge, teachers always accompanied their pupils on the land work done by schools. Boys from two of England's famous schools drove combined-harvesters in East Anglia and assisted to harvest 2,000 acres of corn.

Britain's need of such harvesting assistance is probably greater than that of Australia, but here school boys and girls have demonstrated their readiness to assist where necessary. Many students from public and private schools and from universities have undertaken seasonal work in fields and food processing factories. Not only is their work of immense benefit to the primary industries and to the nation, but it should also develop in our youth a practical appreciation of the nation's requirements and a broader outlook of the part they must play as future citizens.

NOTES CONTRIBUTED . . . .
BY THE BIOLOGICAL BRANCH.

THE EFFECT OF LENGTH OF DAY AND TEMPERATURE
On the Flowering, Seed Production and Growth of Vegetables.*

A KNOWLEDGE of the conditions which predetermine flowering and seed formation is useful in the successful production of vegetables, both for seed and for the vegetative crop. "Bolting," or the premature formation of seed heads in onions, beetroot, cabbages and other vegetable crops, instead of the formation of the vegetative organs required for marketing, is a common source of loss, and conversely, crops intended for seed often fail to run to seed. Is this the result of some obscure accident or can it be regulated so that, according to our needs and intention either a seed crop or a market crop of vegetables can be obtained?

The problem has been the subject of considerable research overseas, and from the results obtained it is now possible to define the conditions which determine seeding in the various crops. Provided caution is exercised not to apply the conditions too rigidly, the knowledge should prove of value in Australia's present vegetable seed production programme. A brief outline of the factors involved and some literature references are given for the use of the seed grower.

The Effect of Length of Day.

Although plants can only flower between certain limits of nutrient and moisture supply, the hours of daylight received and temperature are the two most important factors controlling flowering. Species of plants (and even varieties of a species) respond very differently to a given length of day. Some plants will flower only if they receive less than 12 hours of light daily; others flower only if they receive more than 12 hours. The length of day varies with both season and latitude; this explains why plants bloom only at certain periods of the year and in certain latitudes (*i.e.*, when the day-length is favourable for flowering).

Plants may be divided into three types according to their tendency to come into flower when exposed to a given length of day. These types are conveniently named short-day, long-day and day-neutral plants.

The flowering of short-day plants is initiated or accelerated by a relatively short period of light, while long-day plants respond similarly to a relatively long period of light. Actually short-day plants readily flower through a fairly wide range of daily light hours up to but not above a certain critical light period. The critical light period varies with different plants, but for most plants of both short- and long-day classes, it falls between 11 and 13 hours. If short-day plants are grown in an environment which has a longer day period than the critical, they will not flower. They continue to make vegetative growth. For example, the sweet potato will flower only under short-day periods. If sweet potato plants receive more than 12 hours of light daily, leaf and stem growth continues and they do not come into flower. Short days are also necessary for the full development of the swollen roots of sweet potato.

* Compiled by F. L. Milthorpe, Assistant Plant Pathologist, and Dr. B. Horowitz, Botany School, Sydney University.

Long-day plants, on the other hand, flower through a fairly wide range of daily light hours in excess of their critical light period (including even continuous illumination). If the day-length is less than the critical, these plants do not flower but continue to grow vegetatively. Beet is an example of the long-day plant. If beet plants are grown with a daily light period of

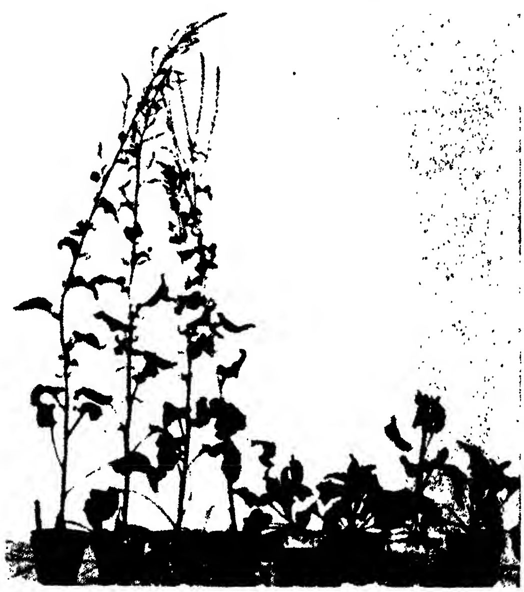


Fig. 1.—Effect of Length of Day on Development of Seed-stalks in Beet.
The four plants on the left received 15–17 hours of light daily while the four on the right received 11–14 hours of light daily.
[*After Chroboczek.*

over 12 hours at favourable temperatures, they rapidly come into flower. However, if the light period is less than 12 hours a day, the plants will not produce seed-stalks but will remain in a vegetative condition (Fig. 1).

The third group of plants, the day-neutral types, are not influenced by length of day. They flower readily under either short or long day length. Most varieties of cabbage and tomato belong to this group.

Day lengths in New South Wales during September-November and February-April would include the critical photoperiods of a large number of different plants.

Table 1 sets out the approximate variations in length of day which may be expected within the Commonwealth from latitude 10 deg. to 45 deg. within the four seasons of the year.

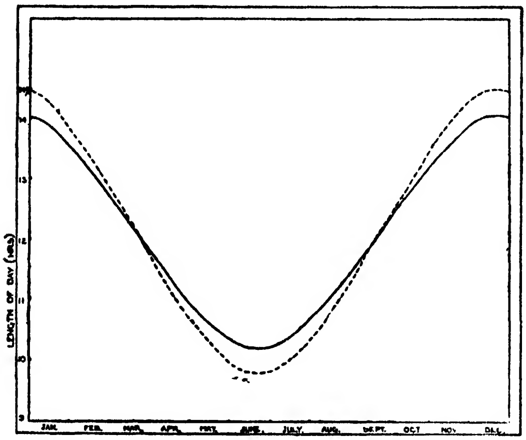


Fig. 2.—Variations in Length of Day During the Year for Latitude 30° S., e.g., Grafton (continuous line); and Latitude 35° S., e.g., Nowra (broken line).

TABLE 1.—Variations in length of day within the Commonwealth.

Lat.	Length of Day.			
	March 21.	June 22.	Sept. 22.	Dec. 22.
	hours.	hours.	hours.	hours.
10°	12·04	11·32	12·06	12·43
20°	12·02	10·55	12·06	13·21
30°	12·01	10·13	12·06	14·55
35°	12·00	9·48	12·06	14·81
40°	11·59	9·20	12·06	15·02
45°	11·58	8·46	12·06	15·37

Variations within New South Wales for latitude 30 deg. (Grafton) and 35 deg. (Nowra) throughout the year are shown in Fig. 2. It will be seen that in both winter and summer the variation in day-length over the Commonwealth is very striking. Further, it will be seen that differences in length of day between different districts of New South Wales at any one time of the year are very small, but variations with time of the year are pronounced. For practical purposes, the time of the year when length of day would be suitable for the flowering of any species in one district of New South Wales would apply equally to all other districts.

The Effect of Temperature.

Temperature, during the vegetative period and during storage, has a greater influence than length of day in determining the time that vegetable crops will flower. There is usually a fairly long period during the year which has a length of day suitable to stimulate flowering in most plants, and the time within this period when plants may be expected to flower is determined to a large degree by temperature. Moreover, unsuitable temperatures can prevent flowering, even if the length of day is favourable. Beet plants, for example, will only flower if exposed to a temperature below 60 deg. Fahr. for a period of one to two months (Fig. 3). Beet plants have been kept in a flowerless condition for as long as three and a half years by growing them in a glass-house at a temperature of 60 to 70 deg. Fahr., even under a long day length. Plants grown at a temperature of less than 60 deg. under continuous illumination have, however, flowered in less than two months.

Flowering in plants like beet, cabbage, celery, onions, spinach, swede turnip and in some varieties of lettuce, is initiated by low temperatures, while in some varieties of lettuce it is brought about by high temperatures.

It has been shown that low temperature treatment of the above vegetables is needed for a limited period of time only. During this period some biochemical changes, not yet fully understood, occur, which result in the switching over of the development of the plant from a vegetative type of growth to a reproductive one, thus enabling the formation of inflorescences and later, seeds. After the initial cool treatment, at a temperature of about 40-50 deg. Fahr., reproductive development is favoured and accelerated by high temperature conditions; temperatures ranging from 60-70 deg., or even higher, have been found most suitable.

TABLE 2.—Mean Daily Temperatures for Each Month of the Seed-producing Districts of New South Wales.

	District.						
	Sydney.	Moss Vale.	Goulburn.	Bathurst.	Armidale.	Dubbo.	Leeton.
	deg. F	deg. F.	deg. F.	deg. F.	deg. F.	deg. F.	deg. F.
January ...	71·7	66·5	69·0	70·8	68·3	78·4	75·9
February ...	71·4	66·5	67·8	69·9	67·1	77·7	76·9
March ...	69·3	62·3	64·1	65·1	63·3	72·4	70·3
April ...	64·7	56·4	56·6	57·3	56·7	64·4	62·4
May ...	58·9	50·1	49·7	49·5	49·5	55·6	54·4
June ...	54·7	45·5	44·6	45·0	44·4	50·1	49·5
July ...	52·9	44·6	42·9	43·1	42·6	48·0	47·8
August ...	55·2	46·4	45·4	45·6	45·1	51·0	50·1
September	59·2	51·3	50·6	50·9	51·1	56·5	55·6
October ...	63·6	56·5	56·7	57·1	56·9	63·7	61·7
November...	67·0	61·3	62·0	63·2	62·9	71·3	68·3
December ...	70·0	64·9	66·5	68·1	66·7	76·1	74·0

By knowing the requirements for flowering of the different vegetable crops, the time of planting can be adjudged according to whether seed or vegetative organs are required. In Table 2 are shown the mean daily temperatures in some of the seed-growing areas of New South Wales. It will be seen that, not only does the mean temperature vary considerably during the year, but it also varies between different districts at any one time of the year. There are also local variations of temperature within each district, so that the figures given must be considered only as a useful indication of the temperatures that may be expected.

Requirements of Main Vegetable Crops.

Available information on the temperature and length of day requirements of the chief vegetable crops is summarised below:—

Beet.

The most favourable conditions for the initiation of seed-stalks in beet are temperatures of 40-50 deg. Fahr. and long days. Temperature, however, is more important than length of day. If mature beet plants are subjected to low temperatures for a period of one to two months they will run to seed. Under temperatures permanently above 60 deg. Fahr., seed stalks are never produced. If beet seedlings are exposed to low temperature for a prolonged period, they will produce seed stalks without forming roots.

The greatest percentage of seed stalks and the highest yield of seed are produced by exposing fairly mature plants to low temperatures. Very young plants do not respond as readily as mature plants. The most satisfactory results for seed production are obtained by growing beet for two or three months before cold weather is experienced. The plants are then of a size and age which respond most readily to low winter temperatures. Good results have been obtained by storing the roots at temperatures of 40-50 deg. Fahr. for two months before planting in the field when the temperature after planting has been high.

When plants are grown under favourable conditions of temperature and length of day, they go to seed more readily if other environmental factors, such as nutrients and moisture, are favourable for vigorous growth than when such conditions are unfavourable. Seeding is not induced by checking the growth of plants by freezing or drought; neither is it induced by insect or disease attack. Rather it is brought about by prolonged exposure to low temperature under conditions which favour growth.

To avoid "bolting," very early planting of beet required for market should be avoided except in warm localities.

Silver beet requires similar conditions to red beet for seeding, although a longer exposure to low temperatures appears to be necessary.

Cabbage and Other Crucifers.

Seeding in cabbage is influenced chiefly by exposure to low temperatures. The length of day has no effect. The size of the plants at the time when they are exposed to low temperatures is important; the larger the plants, the greater is their tendency to produce seed stalks. It is not essential, however, for heads to form before seeding will occur. Plants transplanted in the late autumn may experience low temperatures before heads are formed, remain in an almost dormant stage during winter, and run to seed in the spring without forming heads.

The tendency of cabbage to go to seed varies with the variety. Varieties with small, compact heads are less likely to go to seed than varieties which are open-headed, leafy and later-maturing. The former require longer exposures to low temperatures than the open-headed types for the initiation of seed-stalks.

Cabbage can be brought quickly to seed by storing at a temperature of 40 deg. Fahr. for two months and then growing in the field at temperatures of 60-70 deg. Fahr.

White turnips and swede turnips require similar conditions to cabbage for the initiation of flowering.

Fig. 3.—Beet Plants Grown at Different Temperatures with Daily Sunlight of 13-15 hours.

The first plant on the left was grown at a temperature above 70 deg. Fahr., the second with a temperature of 60–70 deg. Fahr. and the third with a temperature of 50–70 deg. Fahr.

[*After Chroboczek.*

The curd of the cauliflower is the flower initial, and the leafy part of the plant should be fully developed before the plant becomes exposed to low temperatures to ensure a large curd and full development of the flower stalk. Cauliflowers do not appear to need so long an exposure to low temperatures nor so low a temperature for seed production as do other crucifers.

Carrots.

Carrots require exposure to low temperatures (40-60 deg. Fahr.) for about two months for the initiation of seed-stalks. Their temperature and length of day requirements are very similar to those of beet, and like beet they "bolt" as soon as they pass through the winter.

When grown for market roots in cooler districts, sowing of carrots in early summer allows a longer marketing period before exposure to the low temperatures of winter causes the plants to seed. Such plantings are also desirable for producing carrots of the best shape and colour, as they are likely to experience the most favourable temperatures (60-70 deg. Fahr.). If temperatures are higher than 70 deg. the roots are much shorter and usually give a smaller yield. When temperatures are lower than 60 deg. the roots are longer and more tapered. (See Fig. 4.)

Fig. 4.—Effect of Temperature on the Shape of Carrot Roots.

Plant on the left was grown at 50–60 deg. Fahr., the one in the centre at 60–70 deg. Fahr., and the one on the right at 70–80 deg. Fahr.

[*After Barnes.*

Growth in soils of low moisture content has a tendency to produce roots tapered at the lower end and to produce smaller roots. The best colour is obtained in carrots by growing at temperatures of 60-70 deg. Fahr. and in soils of moderately low moisture content. Temperatures higher than 70 deg. or lower than 60 deg., and high soil moisture, result in a decrease in colour. (The colour which is desired in carrots is a deep orange-red. It is due to the pigment carotene, which is a precursor of vitamin A. Carrots of good colour, therefore, have a higher vitamin content than carrots of poor colour.)

Celery.

Contrary to common belief, a serious check in growth delays seed-stalk development in celery and may prevent it entirely. Freezing the plants, allowing them to become stunted by crowding in seedbeds, or allowing the soil to become dry materially delays seeding. Subjecting young celery plants to relatively low temperature (40 to 50 deg. Fahr.) for two weeks or more is, however, likely to result in premature seeding. This may result from early planting in the spring in some districts.

If a high percentage of seed stalks is required in a seed crop it is advisable, in mild districts, to plant the crop so that it will mature before winter. After experiencing the low winter temperature, it will run readily to seed in the following spring.

Lettuce.

There are differences in the behaviour of varieties of lettuce as regards seed and head formation. Low temperature treatment for 10 to 20 days at 40 deg. Fahr. during the period of germination and early growth, stimulates seed-stalk production, if such conditions are followed by high temperatures and long photoperiods. On the other hand, germination under high temperatures (70-80 deg. Fahr.), followed by low temperature conditions, gives a marked increase in fresh weight, and thus in the marketing value of the plants. It has also been stated that under short-days a similar result is obtained, as such day-lengths favour the development of rosettes of leaves and increase the head weights. From the above it appears that a cool period about the time of sowing, followed by a sudden increase in temperature, is best for seeding of lettuce.

Onions.

Onion varieties vary greatly in the day-length requirements for bulb development. The relationships are as follow:—

- 12 hours—Yellow Bermuda, Early Grower and others.
- 13 hours—Ebenezer, Yellow Danvers Flat and others.
- 13½ hours—Early Yellow Globe, Australian Brown and others.
- 14—Flat Madeira, Bloodred Flat Dutch and others.
- 14½—Yellow Globe, Danvers.
- 16 hours—Yellow Flat Dutch, Zittau Yellow and others.

It is obvious that, with varieties which require long days for bulb formation, satisfactory results cannot be obtained by growing them at periods of the year when the days are short because the plants remain in the stage of leaf development and either no bulbs or very small bulbs are formed. On the other hand, the growth of a variety with short-day requirements for bulb formation under a long photoperiod, gives quickly maturing plants and poorly developed bulbs.

Seed-stalk development in onions is accelerated by long days and relatively low temperatures, and is inhibited by high temperatures. When grown for prolonged periods at temperatures of 50-60 deg. Fahr., seed-stalks are produced without bulbing first taking place. This relationship may explain why onions grown in late autumn, winter and early spring often "bolt"; the size of the plants when the period of critical temperatures of 50 to 60 deg. Fahr. and the increasing

day-lengths of spring, are experienced, determining whether the plants will run to seed. Large plants at this period bolt more easily than small ones. (On the other hand, when onions are grown at the moderately warm temperatures of 60 to 80 deg. Fahr., bulbs are formed and the plants will not go to seed.)

High yields of seed can be obtained from large bulbs stored at or exposed to temperatures of 40 to 50 deg. Fahr. for at least thirty days.

If sets are required for seed production they should be over an inch in diameter and stored at 40-50 deg. However, if required for the production of market bulbs, the sets should be from one-half to an inch in diameter and be stored at temperatures of 30-32 deg. Fahr.

Although large sets run to seed more readily than small sets, the larger the sets the higher the return of marketable bulbs, *if the sets have been stored at temperatures least favourable for seed-stalk development* (*i.e.*, 30-32 deg. Fahr.).

The production of "split" or "double" bulbs is also influenced by the size of the sets and the temperatures at which they have been stored. In general, the percentage of "split" bulbs is highest from sets which have been stored at temperatures least favourable for seed-stalk development (*i.e.*, 32 deg. or 60-70 deg. Fahr.). Size of sets is more important than temperature, large sets producing a larger percentage of "split" bulbs than medium-size or small sets. Wide spacing also increases "splitting" of bulbs.

Tomatoes.

Flower buds of tomatoes are formed under a wide range of conditions, but the setting of fruit is limited to a very narrow range. Falling of blossoms occurs very readily if conditions are unfavourable. Temperature is important in the production of fruit and good seed, but its effect is closely associated with the nutrition of the plant. Fruit setting is most successful where the plants show moderate vegetative vigour rather than excessive or low vigour. If the soil is very high in nitrogen, the plant makes very succulent growth and will not set fruit. If the soil is low in nitrogen, plants make stunted growth and little fruit is set. Plants grown at relatively high temperatures require a higher level of nitrogen than plants grown at cool temperatures.

High temperatures and low humidity, especially if associated with hot dry winds, are conducive to rapid transpiration which results in blossom drop.

Tomato plants required for seed should therefore be grown in moderately warm climates. Regions with mean daily temperatures of 60-70 deg. Fahr., and high light intensity (*e.g.*, tableland districts) should prove best.

REFERENCES.

BARNES, W. C.—Effects of some environmental factors on growth and colour of carrots. Cornell Univ. Expt. Stn. Memoir 186. 1936.

BOSWELL, V. R.—Studies of premature flower formation in wintered-over cabbage. Md. Agr. Expt. Stn. Bull. 313. 1929.

CHROBOCZEK, E.—A study of some ecological factors influencing seed-stalk development in beets (*Beta vulgaris* L.). N.Y. Cornell Agr. Expt. Stn. Mem. 154. 1934.

JONES, H. A., & ENSWELLER, S. L.—Effect of storage, bulbs size, spacing and time of planting on production of onion seed. Calif. Agr. Exp. Stn. Bull. 628. 1939.

KRAUS, E. J., & KRAYBILL, H. R.—Vegetation and reproduction with special reference to the tomato. Oregon Agric. Expt. Stn. Bull. 149. 1918.

KNOTT, J. E.—The effect of temperature on the photoperiodic response of spinach. Cornell Agric. Exp. Stn. Mem. 218. 1939.

MARGRUDER, R., & ALLARD, H. A.—Bulb formation in some American varieties of onions as affected by length of day. *Jour. Agr. Res.* 54, No. 10, May 15, 1937.

MILLER, J. C.—A study of some factors affecting seed-stalk development in cabbage. Cornell Univ. Agric. Expt. Stn. Bull. 488. 1929.

NIGHTINGALE, G. T., SCHERMERHORN, L. G., & ROBBINS, W. R.—The growth status of the tomato as correlated with organic nitrogen and carbohydrate in roots, stems and leaves. N.J. Agric. Expt. Stn. Bull. 461. 1928.

THOMPSON, H. C.—Effect of size of sets and of storage temperature on yield and on the production of doubles in onions. *Proc. Amer. Soc. Hort. Sci.* 32: 558–560. 1934.

——— Vegetable Crops. 1939.

——— & KNOTT, J. E.—The effect of temperature and photoperiod on the growth of lettuce. *Proc. Amer. Soc. Hort. Sci.* 30: 507–9. 1933.

——— Premature seeding in celery. Cornell Univ. Agr. Expt. Stn. Bull. 480. 1929.

——— & SMITH, O.—Seed-stalk and bulb development in the onion. Cornell Univ. Agr. Exp. Stn. Bull. 708. 1938.

WATTS, V. M.—Some factors which influence growth and fruiting of the tomato. U.S.D.A. Bull. 267. 1931.

Yearbook for Agriculture, U.S.A. 1937.

The Vitamin Content of Black Currant.

LAST year, black currant syrup and puree were included, together with milk, eggs, oranges, and cod-liver oil in the British Ministry of Food's Vitamins Scheme, in connection with which young children and invalids were eligible to receive priority supplies. Black currant syrup and puree are now being replaced by orange juice, of which increased supplies are available from America, but arrangements have been made for the same quantity of black currants as last year (slightly over 2,000 tons) to be made into syrup and puree for sale through retail chemists for children, invalids and others who are advised to increase their consumption of Vitamin C.

Both syrup and puree will be sold under the manufacturers' names, but will bear labels which have been approved by the Ministry of Food and the Ministry of Health, indicating the classes of persons (as above) to whom alone they may be sold, the price and the minimum Vitamin C content. Retail chemists are being informed by the National Pharmaceutical Union of the terms of these labels, so as to protect the public from undesirable imitation.

The syrup will contain not less than 20 mgs. of Vitamin C per fluid ounce and the puree not less than 24 mgs. per fluid ounce, so that these products will provide a valuable addition to the quantity of Vitamin C obtainable from other foods. The total pack will contain as much Vitamin C as 4,000 to 5,000 tons of fresh oranges.

Keep On Buying War Savings Certificates.

MECHANISATION OF NAVY BEAN GROWING.

Methods Used in the United States.

JOHN DOUGLASS, H.D.A., H.D.D., Special Agricultural Instructor.

IN the larger bean growing areas of the United States, particularly in California, the production of the navy bean crop has become highly mechanised, whereas in other states such as Michigan and Colorado where beans are grown in small areas a good deal of horse cultivation is carried out.

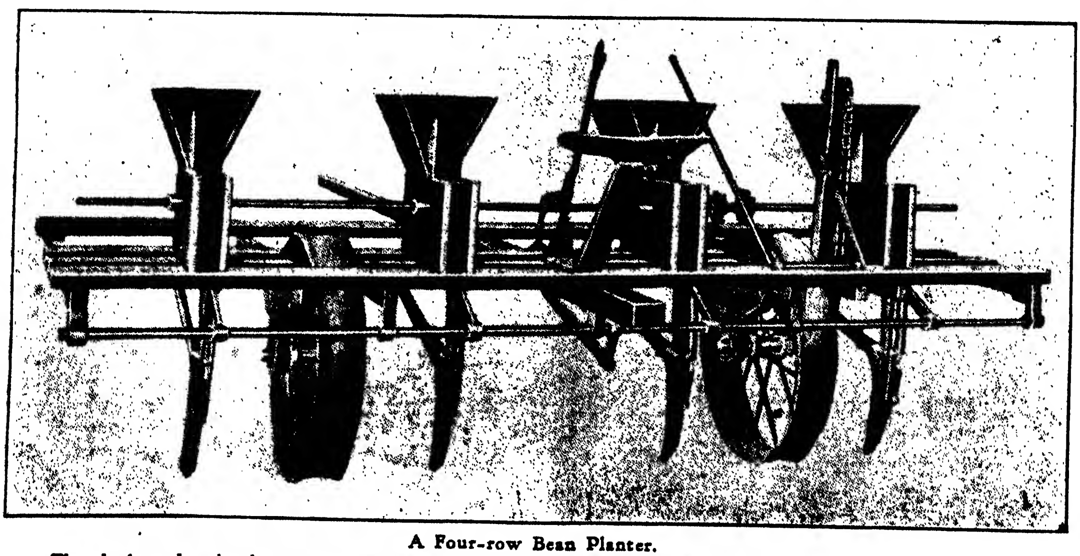
The following notes of recent observations of the methods and machinery used in America should be of interest to growers in this country who are producing this crop.

Generally speaking, soil preparation for navy bean growing is carried out by the use of tractors. The advantage of mechanisation of this operation is that it is comparatively easy to cultivate a large area rapidly at the right period for weed seedling destruction. Soil preparation is carried out over a short fallow period, with the final operations arranged so as to destroy weed growth without deeply turning out the soil and at the same time so as to prepare a very fine mulch for the seed.

Seeding and Cultivation.

In all districts multi-row seed sowers are used to plant this crop. These seed sowers are special bean machines which are constructed to handle the various sized bean varieties and to plant them at a maximum depth of 2 inches. The big advantage of multi-row seed sowers lies in the fact that they assure that the majority of rows are parallel, which allows machinery to be adapted for cultivating, harvesting, etc., with the greatest efficiency.

In the wide-scale navy bean areas the whole of the cultivation of the crop is carried out with ground tools attached to the tractor. In lighter soils the tractors move at high rates of speed, which make it essential that the rows be straight, so destroying all weeds, and making hand hoeing unnecessary. In the smaller areas a two-row corn cultivator is usually used for cultivating, but here again, efficiency is largely governed by the straightness of the rows.



A Four-row Bean Planter.
The wheels are broad and concave to avoid skidding) and the seat is located for straight driving—an important matter in the planting machine

Harvesting.

The usual method of harvesting navy beans is to cut or "pull" them with a machine known as a navy bean harvester. This machine may be attached to a tool bar of a tractor or may be horse-drawn. It usually consists of two large lightly-tempered steel blades, which are set at an angle to the rows of beans. Usually two rows of beans are cut at a time, the plants being rolled into a windrow by means of steel director arms. In some districts the tractor-driven harvesters will cut four rows at a time.

The bean harvesting is usually carried out at night or in the early hours of the morning up to approximately 10 a.m. During this period the plants are usually damp with dew, the pods are toughened and will not shatter. Some bean harvesters have a rake attachment which enables the operator to cock the crop.

Navy bean harvesting machines will work on all types of soil from hard granite rain-beaten soil to soft muck soils, and even in weedy ground. However, where the soil is exceptionally hard it is necessary to weight the machines down with bags of sand or other weights in order to get the best results.

Threshing.

The crop may be threshed either in the field or in the barn. The usual method of threshing in the field is to wait until the crop is thoroughly dry, and then carry out the operation with an allcrop harvester. This small, specially constructed harvester has rubber-lined beaters and controlled peg drum speeds and air blast. For beans it is necessary to make adjustments according to the variety, but generally speaking the speed of the peg drum must be 300 to 500 r.p.m. with a wind blast at full strength. It is a common practice in dry weather to harvest in the morning and thresh the crop in the field in the afternoon. Most allcrop harvesters are fitted with a pea vine pick-up for this work. This picking-up apparatus actually lifts the crop from the field to the elevators, from which it is conveyed to the peg-drum. In America the majority of allcrop harvesters have a power take-off from a tractor, which enables the harvester to operate when stationary. Thus small crops can be threshed conveniently either in the field or shed.

The Stationary Thresher.

The operation of a stationary thresher is well-known under Australian conditions. The threshers are specially constructed for the handling of peas and beans. They are designed to avoid shattering or injuring these large seeds in the threshing operation.

When the navy beans are to be threshed in the shed it is the usual practice to employ a special pea-bean thresher. These threshers usually have two comparatively slowly-driven peg-drums with adjustable speeds. There is also an adjustable draft, thus giving control over the cleanliness of bean samples.

An Allcrop Harvester with Pick-up Attachment.

Warehouse Equipment.

Despite the utilisation of highly specialised and up-to-date mechanical harvesting of dried beans in America, the whole of the crop is still treated by warehouse equipment in order to bring the produce up to canning quality. This equivalent varies with the type of bean grown. There are dozens of various machines acting on different principles for the cleaning and finishing of the beans. The most perfectly controlled machine is that known as the Electric Eye, which discards all stained beans and foreign matter.

The Commonwealth Government has secured a small number of highly specialised machines which will enable the farming community to clean navy beans to within a very small percentage of canning quality, providing they are not too stained.

The Eddy-Giant Picker machine consists of a series of adjustable rubber rollers. The rollers are adjusted with a small space between each, and at an angle to allow the beans to slide down the rollers. Small beans or pieces of soil and clods, either fall between the rollers, or having a roughened surface, are gripped by the rubber rollers and crushed. The same principle applies to those very badly stained, roughened beans. They do not slide down, but are gripped by the rollers and are passed below.

The No. 2 Clipper Bean Cleaner is fitted with rubber rollers, which crush clods enabling them to be passed through sieves or through the wind blast as dust. This machine, with a series of sieves and wind blast, is able to remove all foreign matter from the beans.

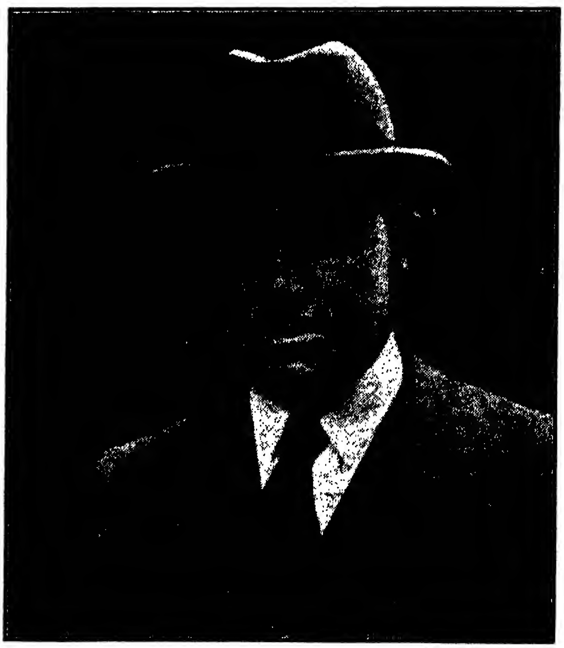
DEATH OF MR. F. H. HARVEY.

MR. F. H. HARVEY, who for some years past had been Officer-in-Charge of the Pastures Protection Section of the Department of Agriculture, died on Saturday, 2nd January, after an illness extending over some months. The news of his death will be received with regret throughout the State, particularly by those associated with pastoral industries, and by his fellow officers in the Department, who extend their sympathy to the members of his family in their sad loss.

Paying tribute to his memory, the Minister for Agriculture and Forests (Captain the Hon. W. F. Dunn, M.L.A.) said that Mr. Harvey had proved himself a highly efficient administrator, whose personality and kindly disposition had gained him many friends both inside and outside the Service.

Mr. Harvey was in his 60th year and had been in the Government Service for forty-three years—of which all but nine had been served in the Department of Agriculture. For some years he was First Clerk of the Department and Secretary of the Farrer Memorial Trust, and was subsequently Secretary to the Stock Branch, as well as Regisstrar of the Board of Veterinary Surgeons.

He is survived by Mrs. Harvey and a daughter, and by three sons, who are in the A.I.F.—Major F. Harvey, Captain Jack Harvey (who was with the 9th Division at Tobruk), and Lieut. W. Harvey.



The Late Mr. F. H. Harvey.

Fruit Drying.

J. A. Ballantyne, Special Fruit Instructor.

The Drying of Slipstone Peaches.

THERE are several essentials that must be complied with if a first class dried product is to be turned out. The first is that the fresh fruit to be dried must be of first class quality. Drying peaches is carried out to prepare a principal product, and not a by-product by the using of "reject" fruit. The peach must be fully mature prior to treatment. If the fruit is allowed to ripen on the tree, however, it will bruise during picking and handling prior to cutting; it is advisable, therefore, to pick when on the firm side, allowing the peaches to ripen in cases, to be removed for drying when they have reached the eating ripe stage.

Sulphuring of the fruit should be carried out as soon as possible following cutting. About 8 lb. of sulphur to the ton of fresh fruit is usually ample, but no hard and fast rule can be laid down in this regard. During the period of sulphuring the chamber must be kept filled with sulphur fumes, so that the amount of sulphur required to maintain these fumes will depend not so much on the weight or amount of sulphur, as the nearness or otherwise of the chamber to being air tight.

Some oxygen must be admitted to the chamber during burning, otherwise the sulphur will not burn freely. If too much air is allowed to get into the box, and there is a considerable leakage of the fumes, the sulphur may burn out quickly and be lost. Slipstone peaches will require to be in the sulphur fumes for a period of about 10 hours. If the box is "draughty" a second charge of sulphur may have to be given in order to keep the fruit under fumes for the desired period. Correct sulphuring of the fruit is denoted by a ready "slipping" of the skin from the flesh and some juice in the cups.

The drying ratio of peaches is in the vicinity of 1 to 6.

Drying Clingstone Peaches.

In view of the possibility of having to dry, during the coming season, a proportion of the peach crop normally grown for canning, experiments have been carried out with a view to obtaining some necessary data and ascertaining the procedure to be followed in the production of a high class dried product.

The type of clingstone peach easiest to handle, especially in the matter of peeling, is the clear skinned type—varieties such as Golden Queen and Phillips. Pullar, which after all is the variety most likely to be dried, requires more care in selecting the fruit at the right stage of ripeness. If the fruit has not reached this stage difficulty will be experienced in removal of the skin. The trouble is mainly confined to that portion of the skin which is blushed, as this portion adheres tightly to the flesh.

The peaches are halved and pitted and then passed through a caustic soda bath to remove the skin. The strength of the lye, which is held at boiling point, should be in the vicinity of 2 per cent. (1 lb. caustic soda to 5 galls. water), and the time of immersion of the fruit in the lye will be approximately one minute. These two factors will be determined by the time taken for the skin of the peach to turn black.

Tray of Peaches Ready for Fumigating.

The peaches are then rinsed in or passed under jets of clean water to remove the skin and to wash off the lye.

The fruit is hand picked for size, and all blemishes are removed, various sized fruit being placed on separate trays. When the trays are filled they are placed in the sulphur box or house. Sulphuring should be carried out as soon as possible after the fruit has been placed on the trays.

No difficulty is experienced with peaches in obtaining satisfactory sulphuring and at the same time keeping within the allowed tolerance of 14 grains of sulphur dioxide per lb. of dried fruit. Experiments have shown that sulphuring extending up to 15 hours is not excessive. It is recommended that where possible, the fruit should remain in the sulphur house overnight or given the equivalent of up to twelve hours sulphuring. Where facilities for this period of sulphuring are not available, a shorter period may be found satisfactory. In tests carried out there was no difference in quality of the dried fruit and very little in the sulphur dioxide content between a 10-hour and 15-hour sulphuring.

From the sulphur chamber the trays of fruit are placed straight into the dehydrator. With temperatures ranging from 140 to 150 deg. the fruit should be dried in about 24 hours. A finishing temperature in excess of 150 deg. can be used, with consequent reduction of the drying period required.

When dried, the fruit should have a moisture content of around 18 per cent.

For the purpose of calculating tray space required, a 4 feet x 3 feet tray (actual available space about 11 square feet) will hold, on an average, about 35 lb. of pitted peaches. Approximately sixty-five of these trays would be required to handle 1 ton of fresh pitted fruit.

Prunes and Plums.

(Plums for Home Use Only.)

THERE are three intervals in the ripening of prunes. The first prunes that ripen do not as a rule contain the same amount of sugar as those that ripen in the second and third stages. As prunes that are deficient in sugar are subject to mould and also to an incrustation of sugar on the surface, which is sometimes mistaken by consumers for mould to the depreciation of their value, it is recommended that the prunes that ripen first be kept separate from the main ripening and disposed of immediately they are ready for consumption.

This first ripening invariably falls, if it is allowed to do so, and as a matter of practice it should be allowed to fall and should never be picked. A large percentage of the second ripening stage will also fall when sufficiently ripe, but as a rule the

fruit of the third ripening stage will require to be picked, as they seem to adhere very tightly to the branches even after they are fully ripe.

In all cases it is most important that the fruit should be allowed to attain its full percentage of sugar before drying, and all undeveloped fruit should be discarded As the fruit is permitted to drop to the ground, precautions should be taken by the grower to see that the surface is loose and free from clods; in fact, the careful grower will take the precaution of raking around the base of the tree and outwards for a sufficient distance to catch any fruit that may drop from the spreading branches.

Following harvesting the prunes can be placed into the dipping basket and submerged in the boiling caustic dip. The strength of the dip varies considerably according to variety, condition of prune, etc., and can only be arrived at by test. The amount of caustic may vary from 1 lb. to 15 gallons of water to 1 lb. to 80 gallons. Caustic soda should be slowly added to the water (which must be kept boiling) until such times as minute cracks appear on the skin of some of the prunes, following an immersion of no more than about 5 seconds.

When rolled on to the trays, the prunes can be put out to dry. Should the weather be hot, the trayed prunes must be stacked, otherwise the fruit will scald, exude juice, and become case hardened.

When dry, the fruit should be stored and sweated, in order to obtain a uniform moistured prune. Sweating may be carried out in boxes or in bags or by simply tipping the fruit on to a concrete floor. Whichever method is adopted, the prunes should be turned over several times, at say, fortnightly intervals; if on the floor by the use of a shovel or if in bags by an alteration of the bag position in the heap; and, if in boxes, by simply tipping from one box to another.

On completion of sweating, the bagged fruit is stacked in preparation for the final processing prior to the selling of the product.

Drying Apples.

ALTHOUGH reject apples are usually used for drying, such "rejects" must come up to a certain standard; otherwise, not only will the resultant product be of poor quality, but the cost of preparation will be too high to make the venture a success. Generally, 2½-inch diameter fruit is the smallest which should be used. Apples irregular in shape, or "mothy," should be discarded —likewise, mealy fruit or those affected by rots. Any variety can be successfully used, but the midseason or late, white, firm-fleshed varieties are most suitable.

For commercial apple drying, some plant is required. In the case of fruits such as peaches, apricots, prunes, etc., it is possible, with some little ingenuity, to erect a plant suitable for the purpose. This is not so with apples. In the first place, a peeling and coring machine is necessary (these are unprocurable at the present time), and in the second, a slicing machine is desirable, although not absolutely necessary. For the production of a high grade product, a further machine which removes the seed cells (a most undesirable feature of many apple pulps on the market) is required. A dehydrator is essential, for although it is possible to sun dry the fruit, considerable care and additional hand work are required.

A Movable Type of Sulphur Box.

The apples are first treated by the peeling and coring machine; then the cells removed if a seed cell machine is available. The

fruit is then carried to the trimmers, which remove any skin which the machine may have missed, and of course any discoloured flesh should be cut away. Following trimming, the apples are generally cut into slices which should be about ¼ inch thick.

The fruit must now be treated by dipping or sulphuring, or a combination of both. In view of the general lack of first-class equipment, with the resultant lengthening of the time taken to get the fruit from the peeling and coring machine to the dried stage, it seems highly probable that the better method to adopt is the combined one.

The two treatments consist of dipping the fruit in—

(1)	Potassium metabisulphite	2½ lb.
	Citric acid	2 oz.
	Water	20 gal.

(2) Placing the slices on the trays and submitting the fruit to sulphur fumes for about one hour.

The combined treatment consists of both dipping and sulphuring. Where this is being carried out, the period of sulphuring could probably be reduced to half an hour. From the sulphuring, the apple slices are taken straight to the dehydrator and dried.

Drying of Pears.

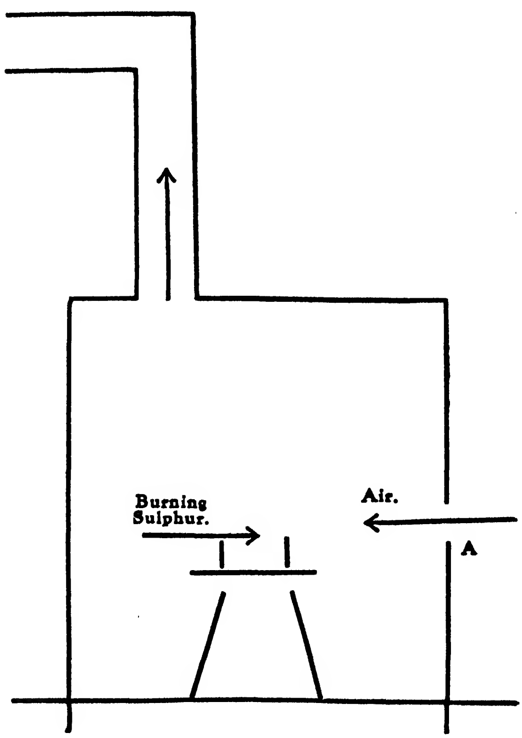
THE Williams or Bartlett pear is the only pear dried commercially. The fruit should be held in boxes and the ripe fruit sorted for drying every few days; it should be fully eating ripe for drying. Very large pears should be avoided as they take too long to dry.

The fruit should be cut in two and placed cut side upwards on the wooden drying trays, and then sulphured. The pear does not absorb the sulphur fumes readily, and to obtain a good coloured article it is necessary to expose to the fumes for 18 to 20 hours, sometimes necessitating recharging the sulphur chamber after about 12 hours. To test whether the pear is sufficiently sulphured lift a fruit from a tray and feel the portion that was resting on the tray. If this portion is spongy it indicates that the fruit is sufficiently sulphured. If, on the other hand, hard portions are felt under the skin, the fruit should be replaced in the chamber and sulphured again. When sulphuring is complete the trays of fruit are stacked in such a manner that the air will pass freely through the trays, the top tray being covered by an empty tray to shade it from the sun; or the trays may be placed on a drying rack and protected from the sun by the hessian curtains.

Pears wholly dried in the shade are a pale translucent colour, which is preferred by the trade. If it is desired to hasten drying, the fruit can be exposed to the sun by spreading the trays after the fruit is partially dried in the shade, but exposure to the sun in this way will result in a golden brown colour. Pears, being a very fleshy fruit, take four or five weeks to dry. When partially dry, drying can be completed in an evaporator.

Sulphur Burning.

CERTAIN grades of sulphur now available for the preservation of dried fruits have been found to burn very poorly, especially in an enclosed space in which some of the



oxygen supply has been partly exhausted. As far as can be ascertained, pre-war flowers of sulphur, which did not give this trouble, is no longer available in quantity. The

poorly burning sulphur is not as pure as the flowers of sulphur and differs from it in appearance. It is not such a bright yellow, and its poor burning qualities are doubtless due to its impurities.

To ensure the burning of this grade of sulphur, it is of first importance to maintain an adequate supply of oxygen by means of a draught. The accompanying sketch shows a device in which the principle of the chip bath heater is employed, which may prove useful.

It could be made from a petrol tin. "A" is an opening with a shutter which can be closed up to any desired extent. This will enable one to control the air supply. The draught will largely depend on the height of the outlet pipe at the left and will, of course, be greatest when the aperture at A is wide open. If the draught under these conditions should be too great, it can be reduced by closing the opening A.

It is important to get the sulphur burning well at the beginning, and this may best be done by means of live coals. The sulphur should be placed on a suitable container, preferably in an earthenware saucer.

The device should be placed outside the sulphur chamber, and connected by a coupling with a permanent pipe through the wall at one-third of the height of the chamber. This will allow the operater to note the behaviour of the sulphur, control the draught easily and, without inconvenience, recharge with sulphur.

Should the stove be placed inside the sulphur box, care must be taken to see that there is an inlet for the admission of air opposite the shutter of the stove.

FURTHER information and leaflets on the drying of fruits are available on application to the Department of Agriculture.

The control of pests of dried fruits is dealt with in Insect Notes on page 67 of this issue.

Protective Treatment of Grape-picking Containers.

As a result of the war, the once ubiquitous petrol (or kerosene) tin, that popular all-purpose container, is becoming every day more scarce. The shortage is presenting a particular problem to the wine grower, by whom it is largely used at the grape-picking period. Every care should therefore be taken to see that the tins are so treated that they are given the longest possible life.

In the case of the wine grower, however, it is not sufficient that the tins shall merely "last"—as soon as the surface of a tin shows signs of rust it must be regarded as undesirable as a container. The rust particles are carried to the tanks, become incorporated with the mass of fermenting juice or must, and later with the wine, and a very small excess of iron has been found to cause the disorder known as "blue casse," which is particularly troublesome in white wines.

Experiments carried out by the Department have shown that rusting may be prevented and the life of the tins considerably lengthened by painting them inside and out. In the experiments referred to, four preparations were tested—a rather cheap white enamel, a cheap black enamel, a cheap aluminium paint, and a good quality green enamel, of the type often referred to as "lacquer," though it is actually an enamel of an improved character. Of these, the last-mentioned proved the most satisfactory. The surface remained smooth and hard even after several seasons' constant use.

Any coating substance likely to be affected by the acids in the grapes should be avoided.

Where galvanised iron trays or linings are used in vineyard lorries, these also should be painted. The zinc in the coating of iron is liable to attack by the acids in the grapes, and as well as being detrimental to wine quality, is also a poison.

It is suggested that growers who are unable to procure enamel of the type recommended should communicate with their local organization with a view to representations being made regarding the desirability of release of the necessary supplies for this purpose.—H. L. MANUEL, Viticultural Expert.

Approved Seed.

February, 1943.

To assist in the production and distribution of approved seed of recommended varieties of crops and vegetables, the Department publishes in this list each month the names and addresses of growers of such seed. For this service a charge of 2s. 6d. is made for each insertion of each variety listed. The number of varieties listed on behalf of each grower will be restricted to twenty-five for the time being. The Department may inspect the crop producing the seed, and in all cases a sample of the seed must be sent to the Department of Agriculture with information as to the location of its production, and must be accompanied by the fee indicated above.

If any seed producer does not wish to pay the advertising charge he may submit his name with the variety of seed and sample to the Department, and if it is approved his name will be listed in the Department and information will be supplied regarding it to inquirers.

Wheat—

Bencubbin.—Manager, Experiment Farm, Wagga. (5s. 6d. bushel, f.o.r.)
Bencubbin.—Manager, Experiment Farm, Temora. (5s. 6d. bushel, f.o.r.)
Bencubbin.—Manager, Experiment Farm, Cowra. (5s. 6d. bushel, f.o.r.)
Bencubbin.—Manager, Experiment Farm, Trangie. (5s. 6d. bushel, f.o.r.)
Bordan.—Manager, Experiment Farm, Wagga. (5s. 6d. bushel, f.o.r.)
Bordan.—Manager, Experiment Farm, Cowra. (5s. 6d. bushel, f.o.r.)
Dundee.—Manager, Experiment Farm, Wagga. (5s. 6d. bushel, f.o.r.)
Dundee—Manager, Experiment Farm, Cowra. (5s. 6d. bushel, f.o.r.)
Eureka.—Manager, Experiment Farm, Temora. (5s. 6d. bushel, f.o.r.)
Eureka.—Manager, Experiment Farm, Cowra. (5s. 6d. bushel, f.o.r.)
Eureka.—Manager, Experiment Farm, Trangie. (5s. 6d. bushel, f.o.r.)
Eureka 2.—Manager, Experiment Farm, Trangie. (5s. 6d. bushel, f.o.r.)
Ford.—Manager, Experiment Farm, Wagga. (5s. 6d. bushel, f.o.r.)
Ford.—Manager, Experiment Farm, Cowra. (5s. 6d. bushel, f.o.r.)
Ghurka.—Manager, Experiment Farm, Wagga. (5s. 6d. bushel, f.o.r.)
Gular.—Manager, Experiment Farm, Temora. (5s. 6d. bushel, f.o.r.)
Koala.—Manager, Experiment Farm, Temora. (5s. 6d. bushel, f.o.r.)
Pusa 111.—Manager, Experiment Farm, Temora. (5s. 6d. bushel, f.o.r.)
Ranee.—Manager, Experiment Farm, Wagga. (5s. 6d. bushel, f.o.r.)
Totadgin.—Manager, Experiment Farm, Trangie. (5s. 6d. bushel, f.o.r.)
Waratah.—Manager, Experiment Farm, Wagga. (5s. 6d. bushel, f.o.r.)

Wheat—(continued).

Waratah.—Manager, Experiment Farm, Cowra. (5s. 6d. bushel, f.o.r.)
Waratah.—Manager, Experiment Farm, Trangie. (5s. 6d. bushel, f.o.r.)
Bungulla.—Manager, Experiment Farm, Temora. (5s. 6d. bushel, f.o.r.)
Bungulla.—Manager, Experiment Farm, Trangie. (5s. 6d. bushel, f.o.r.)
Gluford.—Manager, Experiment Farm, Cowra. (5s. 6d. bushel, f.o.r.)

Oats—

Belar.—Manager, Experiment Farm, Temora. (4s. 6d. bushel, f.o.r.)
Belar.—Manager, Experiment Farm, Cowra. (4s. 6d. bushel, f.o.r.)
Belar—Manager, Experiment Farm, Trangie. (4s. 6d. bushel, f.o.r.)
Buddah.—Manager, Experiment Farm, Trangie. (4s. 6d. bushel, f.o.r.)
Fulghum.—Manager, Experiment Farm, Temora. (4s. 6d. bushel, f.o.r.)
Gidgee.—Manager, Experiment Farm, Temora. (4s. 6d. bushel, f.o.r.)
Gidgee.—Manager, Experiment Farm, Trangie. (4s. 6d. bushel, f.o.r.)
Guyra.—Manager, Experiment Farm, Bathurst. (4s. 6d. bushel, f.o.r.)
Kareela.—Manager, Experiment Farm, Trangie. (4s. 6d. bushel, f.o.r.)
Mulga.—Manager, Experiment Farm, Temora. (4s. 6d. bushel, f.o.r.)
Mulga.—Manager, Experiment Farm, Trangie. (4s. 6d. bushel, f.o.r.)
Weston.—Manager, Experiment Farm, Cowra. (4s. 6d. bushel, f.o.r.)
Wongan.—Manager, Experiment Farm, Temora. (4s. 6d. bushel, f.o.r.)

Barley—

Pryor—Manager, Experiment Farm, Wagga. (5s. bushel, f.o.r.)
Trabut.—Manager, Experiment Farm, Wagga. (5s. bushel, f.o.r.)

Cauliflowers.

Hawkesbury Solid White—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Tomatoes.

Marvana — Rumseys Seeds Pty. Ltd., 331 Church-street, Parramatta.
Australian Earliana—Rumseys Seeds Pty. Ltd., 331 Church-street, Parramatta.
Rouge de Marmande—Rumseys Seeds Pty. Ltd., 331 Church-street, Parramatta.
Red Marhio No. 95—Rumseys Seeds Pty. Ltd., 331 Church-street, Parramatta.

Onions.

Extra Early Barletta—Mr. R. C. Morandini, Box 74, P.O., Dubbo.
Hunter River Early White Globe—Mr. R. C. Morandini, Box 74, P.O., Dubbo.
Hunter River Early Brown Globe—Mr. R. C. Morandini, Box 74, P.O., Dubbo.

INSECT NOTES.

Pests of Dried Fruits.

THE insects which commonly attack dried fruits are cosmopolitan species, and are also pests of many stored foodstuffs. They are thus known by various popular names which do not indicate, in some instances, their association with dried fruits.

Usually, the most serious pests of dried fruits are the Indian meal moth (*Plodia interpunctella*), **the saw-toothed grain beetle** (*Oryzaephilus surinamensis*), **the dried fruit moths** (*Ephestia* spp.) **and the flour beetles** (*Tribolium* spp.). **Other insects that may infest dried fruits are the dried fruit beetle** (*Carpophilus hemipterus*), **the coffee-bean weevil** (*Araecerus fasciculatus*), **the biscuit "weevil" or drug store beetle** (*Sitodrepa panicea*), **the tobacco or cigarette beetle** (*Lasioderma serricorne*), **the flat grain beetle** (*Laemophloeus minutus*), **and ferment or vinegar flies** (*Drosophila* spp.).

Some of the insects are attracted to the fruit before or while in the process of drying; others infest fruit which has been stored for a long time; and others again infest fruit which has been previously attacked by other insects. The main damage is caused to the fruit by the larvae of the various species of moths and beetles, and these larvae are often popularly referred to as "grubs" or "maggots." The length of the life-cycles of the various insects differs, temperature and humidity playing an important part in influencing their duration.

The Indian Meal Moth.

The larvae or caterpillars of this moth spin silken threads wherever they crawl, and where the infestation is heavy, the food material may become covered with loosely clinging web. This moth is one of the most general feeders amongst the insects of stored products. The basal portion of the fore-wings is silvery-white or grey and the outer portion is a reddish-bronze with slightly darker markings. The hind wings are silvery-grey. The adults avoid light, and rest during the day, with folded wings, on walls, ceilings, under shelves, etc.

Egg-laying takes place mostly at night, and the small, ovate eggs, which measure about one-fiftieth of an inch in length, are deposited either singly or in clusters, and are usually not firmly attached to the surface of foodstuffs or containers upon which they are laid. As many as 300, or more, eggs may be laid by an individual female.

Upon hatching from the eggs, the almost transparent larvae or caterpillars, which measure about one twenty-fifth of an inch in length, disperse, and later begin feeding. On dried fruits with a wrinkled exterior, they enter the crevices where they puncture the skin, and begin feeding near the surface, within, or near a tunnel-like case formed of frass, thrown out and webbed together with silk. In addition to eating the fruit a great amount of damage may be caused by

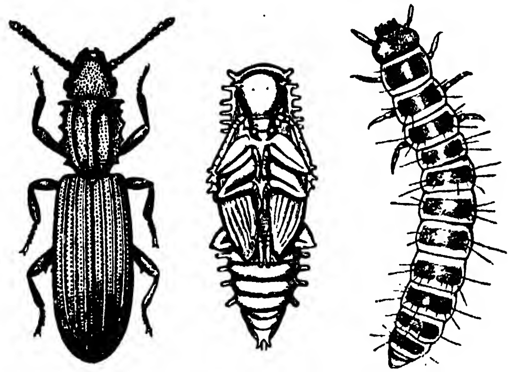
Adult and Larva of the Indian Meal Moth.

the larvae contaminating the fruit with their moist excrement mixed up with tangled webbing and cast skins of larvae and pupae.

The fully-fed larvae are mostly greyish, but many may be light pinkish-brown or greenish. The head and upper part of the first segment (thoracic shield) of the larva, and the upper portion of the last segment of the body are pale brown. The whole

* **Compiled by E. H. ZECK, Entomologist.**

body is sparsely covered with long fine hairs. The fully-fed larvae, which may measure slightly more than ½ inch in length, crawl to the surface of their food-substance, and there, some may spin their cocoons; others may crawl away into nearby cracks in boxes or walls, etc., to spin.



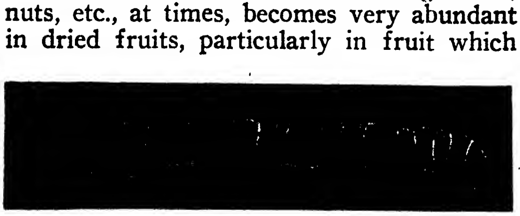
Larva, Pupa and Adult of the Saw-toothed Grain Beetle.
[*After Chittenden.*

The pupa, which measures about ⅜ inch in length, is light brown and glossy, but just before the adult emerges the wing portions become almost black.

The life-cycle, from egg to adult, may be as short as three to four weeks during the warm period of the year, but development is much slower during the colder months. The particular type of food upon which they feed is also a factor in the length of the life-cycle. From four to six broods may occur during the year.

The Saw-toothed Grain Beetle.

This insect, which is a general feeder on various stored foodstuffs including dates, nuts, etc., at times, becomes very abundant in dried fruits, particularly in fruit which

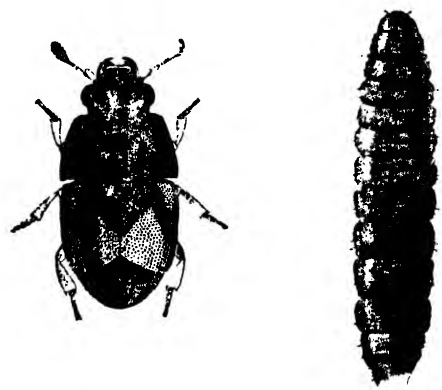


Larva of a Dried Fruit Moth.

has been previously attacked either by the Indian meal moth or the dried fruit moths, or after it has been in store for a long time. Both larvae and adults may feed on the fruit, and where present in large numbers, cause considerable damage.

The adult beetle, which measures about one-tenth of an inch in length, is a flattened, dark chocolate-brown insect, which may readily be distinguished from the other fruit-infesting beetles by the six saw-tooth-like projections on each side of the prothorax. The small, slender eggs hatch in a few days. The larvae may crawl about actively, feeding here and there amongst the fruit, but they may also feed within the smaller fruits, so that little is left but the skin.

The mature larva, which measures less than ¼ in. in length, is whitish with darker markings and when fully-fed may spin a loose covering by joining together small free particles of its food with a sticky substance which it secretes, and within this case enter its pupal or chrysalis stage. The larvae often seek shelter in cracks or crevices before constructing their pupal case. They may pupate, however, amongst the fruit, without any shelter.



Adult and Larva of the Dried Fruit Beetle.

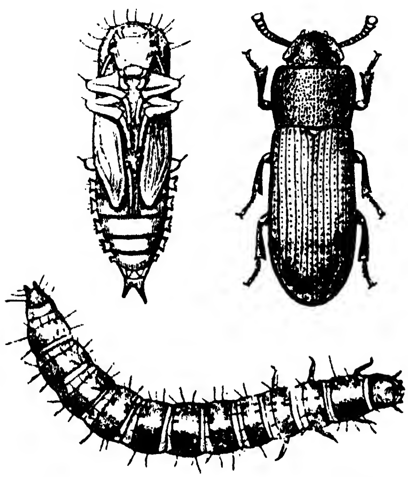
The adults are very active and when disturbed quickly disappear from sight. The life-cycle, from egg to adult, in summer may only occupy three weeks, and five or six generations may occur during the year.

Dried Fruit Moths.

Several allied moths are included in this group, and have received the popular names of the "fig moth," the "raisin moth," etc., on account of their damage to particular fruits. They may, however, infest various kinds of dried fruits, nuts, chocolate, cereal products, etc.

Some species may lay their eggs in open boxes or on drying fruit; others during or immediately after the drying process and before they are stored.

The adults, which have a wing-spread of about ⅝ inch, are pale brownish or greyish-winged moths, with small darker markings.



Larva, Pupa and Adult of a Flour Beetle.
[*After Chittenden.*

The eggs are usually laid singly, either loosely or lightly adhering to the fruit. The larvae or caterpillars spin silken threads amongst their food, and where the infestation is heavy the products become webbed or matted together. The fully-fed larvae measure about ¾ inch in length and are white or reddish, with small dark dots along their bodies. These small dark dots serve to distinguish the larvae of the fruit moths from those of the Indian meal moth, except in their very immature stages. The head and thoracic shield and the upper portion of the last segment of the body is reddish-brown or dark brown.

When fully-fed the larvae spin cocoons in similar situations to those chosen by the Indian meal moth, and enter their pupal stage. The life-cycle from egg to adult may occupy about four weeks during the warm period of the year, but much longer during the colder months. A number of broods may develop during the year.

Flour Beetles.

These insects are general feeders on stored foodstuffs, seeds, etc., and may infest nuts and dried fruits.

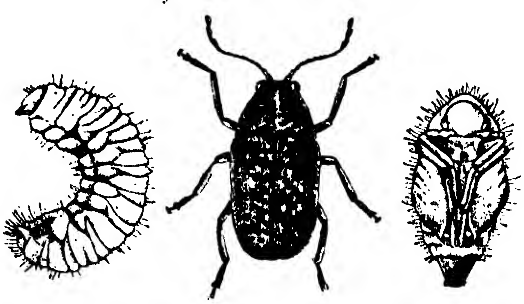
The adults are small, reddish-brown beetles which measure about ⅛ inch in length. The minute eggs are laid amongst the food materials or may be attached to the sides of the container. The fully-fed cylindrical larvae, which measure about three-sixteenths inch in length, are white, tinged with yellow. They transform into small, naked pupae which are at first white, but become brown before changing into their adult forms. The life-cycle from egg to adult may be as short as four weeks in summer.

Dried Fruit Beetle.

The larvae and adults of this insect feed normally in damaged or fermenting fruit, and are commonly found in orchards about fruit which is infested either with fruit fly maggots or codling moth caterpillars, or has had the skin broken through some other agency. They are attracted to fruit during the process of drying, and may be found on the fruit trays or in packing houses, wherever fresh or dried fruits are found.

The larvae will develop freely in and often seriously damage dried fruits of all kinds.

The adult, which measures about ⅛ inch in length, is a black or dark brown, flattened insect, with light brown or yellowish markings on the wing-covers. The larva is elongate, flattened, yellowish in colour, and measures about ¼ inch in length when fully-fed. At the posterior end of its body there are two large brown tubercles and two smaller ones just in front and above them.



Larva, Pupa and Adult of the Coffee-bean Weevil.
[*After Chittenden.*

Coffee-Bean Weevil.

This beetle, which is primarily a pest of coffee, infests a variety of foodstuffs including nutmegs, cacao beans, dried ginger roots, dried fruits, etc.

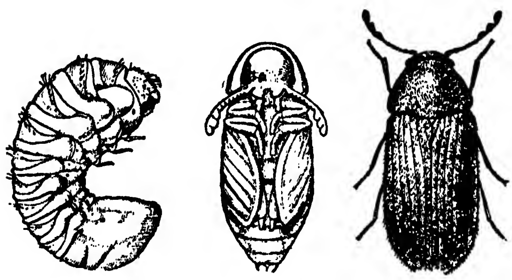
The adult is a very active, robust weevil, which measures about three-sixteenths of an inch in length and has a short, broad snout or rostrum. It is mottled with light and dark-brown pubescence and is a strong flier.

The larva, which measures about ¼ inch in length, is white and legless. Its body is curved, wrinkled, and covered with numerous hairs. The larva bores into its food, within which it enters its pupal or chrysalis stage.

Biscuit "Weevil" or Drug Store Beetle.

This beetle infests various cereal products, pepper, ginger, almonds, seeds of all kinds, dried fruits, etc.

The adult beetle, which measures about one-tenth inch in length, is of a uniform light brown colour, and is covered with whitish pubescence. When at rest its head is withdrawn into the hood-like thorax. It is frequently mistaken by householders for the "furniture beetle" or "wood borer" (*Anobium punctatum*), which it closely resembles, and to which family of beetles (*Ptinidae*) it also belongs.



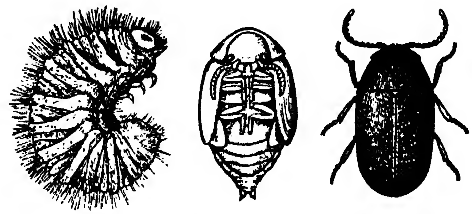
Larva, Pupa and Adult of the Biscuit "Weevil."
[*After Chittenden.*

The eggs are laid amongst the food and the curved, cylindrical larvae, which hatch from these eggs, are white with dark mouth parts. They tunnel through their food, and when fully-fed enter their chrysalis or pupal stage within a small rounded cell or fragile cocoon composed largely of powdered food substance.

During the summer, the life cycle from egg to adult occupies about two months.

The Tobacco Beetle.

This beetle superficially resembles the biscuit "weevil" but is slightly smaller. The larva is more wrinkled and hairy, and differs in the structure of its head and legs. Although primarily a pest of tobacco, it infests many stored products, including pepper, ginger, figs and other dried fruits. Its life-cycle and habits are similar to those of the biscuit "weevil."



Larva, Pupa and Adult of the Tobacco Beetle.
[*After Chittenden.*

Flat Grain Beetle.

This insect is a small, flattened, light brown beetle which measures only about one-sixteenth of an inch in length. It may be recognised by its long antennae which are more than half the length of the body. It breeds in cereals, cereal products, dried figs, dates and other dried fruits and nuts. The fully-fed larvae form cocoons to which food particles adhere.

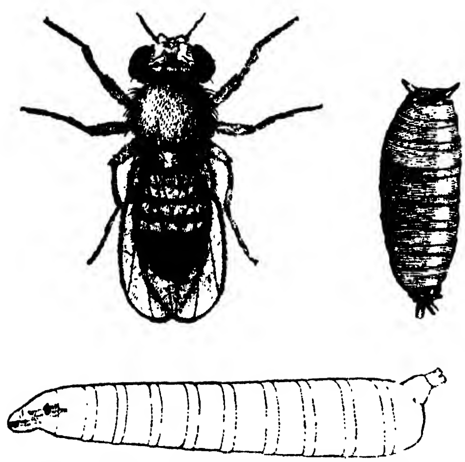
Ferment Flies.

Ferment flies or vinegar flies are attracted by all kinds of fermenting or damaged fruits, fruit juices, etc. These flies are also known as "wine flies," as grapes and grape juices attract them. They are plentiful wherever their food is available, and fruit in the process of drying is attractive to them, but in most instances would not provide sufficient suitable moisture for the development of the larvae or maggots.

Adult of the Flat Grain Beetle.

Damaged fruit or waste, moist fruit materials left lying exposed, however, will serve as suitable breeding grounds for them.

The adult fly, which measures about ⅛ inch in length, is reddish-brown or yellowish and has bright red eyes. The maggots, which when fully-fed measure about ¼ inch in length, may be recognised by the pair of prominent protuberances at the end of their bodies, on which are situated the



[Larva, Pupa and Adult of a Ferment Fly.

posterior spiracles or breathing pores. The pupa is enclosed in a yellow shell or puparium and is shorter than the larva.

The life-cycle from egg to adult may only occupy about eight days.

Control.

Cleanliness where foodstuffs are prepared or stored is essential. Insects will usually thrive where there is sufficient warmth, moisture and food. Therefore, all accumulations of rubbish and waste products should be kept off floors, benches, machinery, etc., as all such materials left lying about may serve as breeding grounds. Damaged or rotting fruit, and waste fruit substances should not be left lying exposed as they will serve to attract various insects.

Ethyl formate, a volatile liquid, is now largely used in dried fruit packing sheds as a fumigant. The liquid is poured on top of the fruit in each box after packing, immediately before nailing the lid on. Where the fruit is stored, subsequent applications of the fumigant are made every two months. Ethyl formate is applied at the rate of 10 to 14 ccs. (one-third to half fluid ounce) to each 56 lb. box, and from 7 to 8 ccs. for 56 lb. tins, less being used for smaller containers.

This treatment does not harm the fruit or affect its flavour. Where boxes without tin linings are used the fumigant evaporates within a few hours. The vapour in tins, also disappears, but more slowly, and as a result of chemical changes, becomes formic acid and ethyl alcohol, which, in the concentrations likely to be present are quite harmless.

Carbon bisulphide may also be used as a fumigant. It should be poured into shallow vessels or on to bagging on top of the fruit. This chemical is allowed to act for twenty-four hours and after fumigation the substances should be thoroughly aired on an insect-free surface to dispel the fumes.

In airtight containers, carbon bisulphide is used at the rate of 5 lb. (approximately 3 1/5 pints) to 1,000 cubic feet of air space —equal to 4 ounces by weight to 50 cubic feet.

Carbon bisulphide is very inflammable and explosive and lights or fires of any kind, lighted cigarettes, etc., must be kept away from it. Even heated hot-water pipes have been known to cause explosion.

The Geologic Sources Of the Commoner Chemical Elements.

Their Agricultural Significance.

(*Continued from Vol.* 53, *page* 518.)

A. N. OLD, B.Sc.Agr., Analyst.

CHLORINE.

NEXT in order of abundance of the elements of known terrestrial matter, after titanium, are the elements carbon and chlorine, each comprising about 0.2 per cent. of the total; carbon is much more abundant than chlorine in the lithosphere, the earth's rocky crust, but chlorine is present as chlorides to the extent of 2 per cent. in the oceans, where it occupies third place, next to oxygen and hydrogen.

In future, the order of abundance will not be strictly adhered to in presenting articles in this series, firstly because with the less common elements it is neither exactly known nor of great significance, and secondly because it is convenient to deal with certain elements in groups. Chlorine for example is the best known member of the halogen group of elements, the other three being iodine, bromine and fluorine.

Chlorine was not recognised as a distinct substance until 1774, when Scheele published in Stockholm an account of the preparation of the gas from what are now known as hydrocloric acid and manganese dioxide. Common salt (sodium chloride) had, of course, been known from remote antiquity, and the alchemists had discovered aqua-regia (a mixture of nitric and hydrochloric acid), and later hydrochloric acid itself. There is little doubt that chlorine was often produced in their experiments long prior to its actual recognition by Scheele.

The French chemist Lavoisier considered the new gas to be a compound containing oxygen, but Humphrey Davy, about 1810, showed it to be an element and gave it its present name and chemical symbol, the word "chlorine" being based on the Greek word for "green," in reference to the colour of the gas.

The Occurrence of Chlorine.

Chlorine does not occur in the free state in nature, but in the combined state it is an important constituent of many minerals. Chief primary geologic sources of the element are minerals such as sodalite ($3NaAlSiO_4.NaCl$) and chlor-apatite ($3Ca_3(PO_4)_2.CaCl_2$) occurring in igneous rocks, and emanations of chlorides from volcanoes and fumaroles—chiefly hydrogen chloride or hydrochloric acid gas (HCl), but also sodium chloride ($NaCl$), potassium chloride (KCl) and ammonium chloride (NH_4Cl) or sal ammoniac. In addition, the hot vapors of HCl form metallic chlorides such as iron chloride ($FeCl_3$) by their action on rocks. Hydrochloric acid is also found free in springs and rivers of volcanic areas.

Other chlorine minerals are those occurring in ore deposits—these include pyromorphite, mimetite, and vanadinite, which are ores of lead (vanadinite is also a source of vanadium), the silver ores, cerargyrite ($AgCl$), embolite ($AgClBr$) and iodobromite ($2Ag(ClBr).AgI$), mercurous chloride or calomel ($HgCl$) and the copper mineral atacamite ($CuCl_2.3Cu(OH)_2$).

Igneous rocks contain about .05 per cent. of chlorine, though types rich in minerals like sodalite may contain as much as .7 per cent. Sedimentary rocks on an average contain about .01 per cent. In some cases where sediments have been laid down in salt water, drainage has not been effective in removing the salt from them after they have become dry land—such salt is called connate salt. An example of such an occurrence is afforded by the Wianamatta Shales of the Sydney district in which the subsurface waters are almost invariably saline.

In the oceans, the 2 per cent. of chlorine already referred to represents 55 per cent. of their total dissolved mineral matter.

Deposition of chlorine minerals may take place from concentrated solutions, and they predominate in most salt lake deposits and in the sub-soil salts of arid regions. Chlorine minerals occurring in the Stassfurt salt deposits include halite or rock salt ($NaCl$), sylvite (KCl), bischofite ($MgCl_2.6H_2O$), carnallite ($MgCl_2.KCl.6H_2O$), kainite ($MgSO_4.KCl.3H_2O$) and boracite ($2Mg_3B_8O_{15}.MgCl_2$). From these salts, compounds of magnesium, potassium, and boron are prepared and chlorine is extracted by electrolysis and other processes from the "mother-liquor" obtained in the purification of the salts. Other well known salt deposits occur in France, Austria, Poland and the U.S.A. Australia does not possess comparable deposits, but large amounts of common salt are obtained from the beds of salt lakes and from sea water.

When rocks are weathered, chlorine is leached out much more quickly than most elements, and it is invariably present as chlorides in sea, river, spring and soil water. Small amounts occur in rain water.

The ash of plants and animals contains chlorides, in fact chlorine compounds are almost universally present in living organisms. The element is an essential one for animals, but is not considered absolutely indispensable to plants. Blood, milk and gastric juices in particular contain a large proportion of chlorides: free hydrochloric acid in the gastric juice is an important agent in food digestion.

Interior of Mine, showing Complex Folding of Salt Deposit.
[*After Schaffer.*

Industrial Applications.

Chlorine is prepared commercially by the electrolysis of chlorides, or as a by-product of soda manufacture. It is used as a

bleaching agent for paper, textiles, etc., as a poison gas in chemical warfare, in gold extraction, as a disinfectant, germicide, and insecticide and in general chemical work. It is interesting historically to note that in 1822, a Mrs. Bryan in her "Conversations on Chemistry" wrote that chlorine "has been used to purify the air in fever hospitals and prisons, as it burns and destroys putrid effluvia of every kind. The infection of the small-pox is likewise destroyed by this gas, and matter that has been submitted to its influence will no longer generate that disorder." This of course was written long before the connection between bacterial growth and disease was established, 1822 being the year of Louis Pasteur's birth.

Chlorine water obtained by passing chlorine into water is used as a chemical reagent and has oxidising, bleaching and antiseptic properties. Calcium hypochlorite or bleaching powder has similar uses. Hydrochloric acid (muriatic acid or spirits of salts) is the best known of the common acids of chemistry and industry. Sodium chloride (common salt) is an article of diet for humans and farm animals and has wide applications in industry, particularly in freezing mixtures and for the preparation of other sodium compounds. Potassium chloride is a well known potassic fertiliser.

Chlorine is very active chemically, and readily forms compounds with most metals and non-metals: in addition to the chlorides, other series of compounds, the hypochlorites, chlorates and perchlorates are well known. Potassium and barium chlorates are used in the manufacture of explosives, fireworks, safety matches, etc., such use depending on the strong oxidising powers of chlorates.

A great many organic chemicals contain chlorine, among them being chloroform, phosgene and trichlorethylene.

Chlorine and Agriculture.

Chlorine shows an analogy with sodium in its relation to agriculture—this of course is to be expected as each occurs most commonly in combination with the other as sodium chloride. Both elements are essential to man and animals. Large amounts of salt are given to animals in licks, a practice which it is now generally conceded has been overdone in this country, particularly in the case of sheep. In this connection a matter of importance is the high salt content of some native plants, such as the salt-bushes. The Queensland Salt-bush accumulates such a large quantity of salt that it has been used in crop rotations in the Sudan with the object of removing salt introduced by irrigation water, one crop being sufficient to remove 1,600 lb. of salt per acre.

Common salt has recently been successfully used in the clarification of muddy water in the excavated tanks of western New South Wales (*Agricultural Gazette*, December, 1942).

An aspect of the distribution of chlorine (chiefly in the form of sodium chloride) which has already been mentioned in dealing with sodium, is its occurrence in natural waters, rivers, creeks, springs, bores and wells. This subject is of special significance for Australia where artesian bore water, ground water and surface waters are of such vital concern to the agricultural and pastoral industries. Again, the saline content of soils and sub-soils becomes a matter of major importance under dry conditions in all parts of the world, especially where irrigation projects are being carried on.

(*To be continued.*)

GUARD YOUR TONGUE.

You may pass on a minor piece of information that is harmless in itself, but linked with other pieces it forms a dangerous chain of rumour.

BREEDING HABITS OF THE DORSET HORN.

The Gestation Period and the Occurrence of Multiple Births.

Observations at Wagga Experiment Farm Stud.

C. J. DALEY and R. EASTOE, Sheep and Wool Instructors.

ACCURATE recordings of service and lambing dates of the stud Dorset Horn ewes, hand served at Wagga Experiment Farm in the season 1941-42, showed that the average gestation period was 144 days—three days less than the generally accepted time. Study of the breeding records of the animals in this stud over a period of years also reveals interesting information on the relation of nutritional conditions during the growing period of the ewe, to the subsequent occurrence of multiple births.

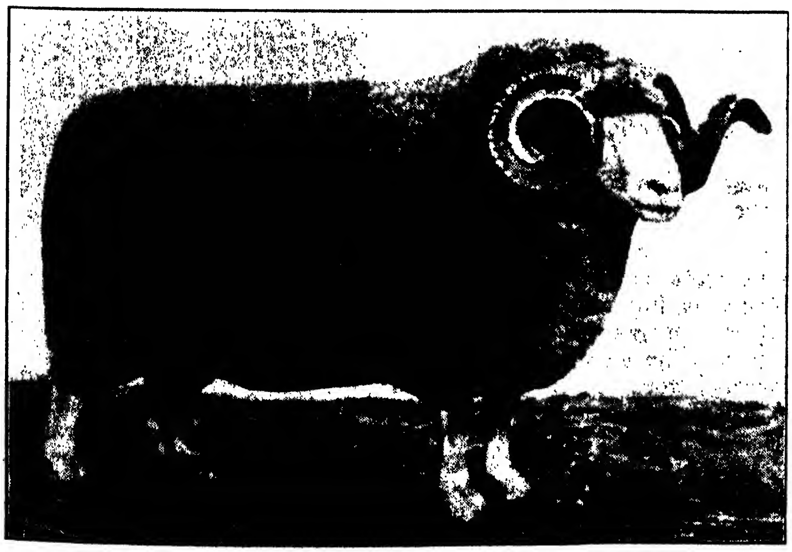
The Gestation Period of Dorset Horns.

Other than the work by Dr. Kelley, little data is available on the gestation period of the various breeds of sheep in Australia. Kelley*, during his studies on fertility of sheep, observed the gestation periods of high and low fertility groups of Merino ewes and a number of Dorset Horn ewes. With the Merinos these observations confirmed, more or less, the 147-152 days' period accepted by breeders for all sheep. However, observations at the F. B. McMaster Field Station, Badgery's Creek, with thirty Dorset Horn ewes from the Wagga Experiment Farm flock, gave an average of 148.6 days within a variation of fourteen days.

Over a period of years, the writers have, when dealing with controlled stud matings of hand service groups, observed lambs arriving well ahead of expectation and causing doubts as to the accuracy of their breeding. To obtain further information on the subject, it was decided to observe any variation within this breed from the considered normal period, following the stud hand service matings of 1941-2 of the stud Dorset Horn flock at Wagga Experiment Farm.

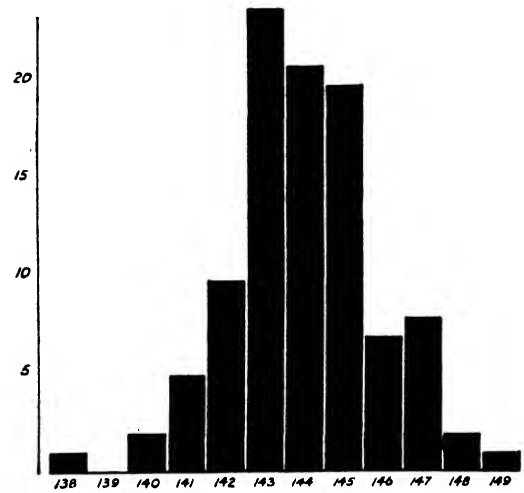
The ewes for these matings had previously been selected on quality, pedigree,

*KELLEY, R. B.—Studies in Fertility of Sheep. Bul. 112, C.S.I.R.



A Typical Wagga Experiment Farm Stud Dorset Horn Ram.

and, with the exception of the maiden 1940 ewes, on past breeding performance. In this stud a reasonable degree of in-breeding to proved strains is customary.



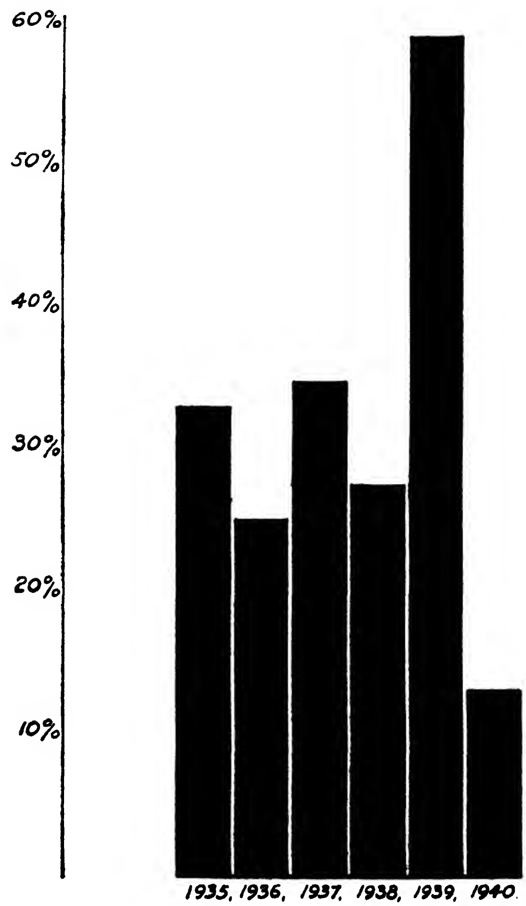
Graph No. 1.
Histogram showing the Frequency Distribution of Gestation for Group of 101 Dorset Horn Ewes.

The procedure of mating was that tested, vasectomised teasers were run with the ewes. The raddled "inseason" ewes were taken from the mob early each morning. These "inseason" ewes were then mated to their selected sire that afternoon, and the following morning and afternoon until oestrum ceased. The date and period of the day, *e.g.*, a.m. or p.m., of the last service to the selected sire was the one recorded. The period of the day of the birth of the lamb was also recorded. Lambs born overnight were recorded as arriving a.m. the day following the night. The mating of the ewes under observation commenced on the 8th November, and ceased on the 18th December, 1941.

Severe drought conditions were experienced leading up to and during mating, and during the greater part of the pregnancy period of the ewes under test. The ewes, at mating, were in good forward store condition, having had prior access to some lucerne for limited periods.

The ewes maintained their condition throughout pregnancy and a green pick was available just prior to lambing. For type, quality and robustness the lambs dropped from the ewes under test this season compared more than favourably with those of past years. The present good year has assisted their development and growth.

The stud sires were maintained in good strong condition prior to and throughout the mating. Seasonal conditions and mating requirements made it necessary to



Graph No. 2.
Histogram showing Percentages of Multiple Births for 97 Ewes of Various Age Groups.

feed throughout this period. The feed allowed them during their service period consisted of a full ration of cereal grains and hay, with occasional access to lucerne. Three stud service sires of varying ages were used, one each born in the autumns of 1937, 1938 and 1940.

Ewes of the 1938 Drop at Wagga.

The Results Obtained.

Accurate details and recordings were thus obtained from 101 ewes. The gestation period, as found, conflicts with that generally accepted for the breed.

Graph No. 1 demonstrates the gestation periods of the ewes under test as a group irrespective of age. It will be seen that 74.3 per cent. of the ewes under test have a gestation period varying from 142 to 145 days; 7.9 per cent. have a period of less than 142 days and only 17.8 per cent. a period from 146 to the maximum of 149 days. The variation between minimum and maximum periods is twelve days.

The following table gives the average period of gestation for each age group within the total recorded, and the average for all ewes irrespective of age. The group average of 144.05 days is three days less than the generally accepted minimum period of 147 days.

AVERAGE GESTATION PERIODS.

AGE GROUPS.

Year	1933	1934	1935	1936	1937	1938	1939	1940	All Ages.
Days	144	145	143·9	144·7	144·05	143·9	143·8	143·6	144·05

1940 Drop Ewes at Wagga.

The variation from the mean of 144.05 days by any age grouping was not great. Indeed, the age groups displayed a remarkably uniformity throughout. The three younger age groupings, as indicated by the tests, were all below the average, but this discrepancy was not great, being greatest with the maiden ewes, and then only to the extent of .45 days.

The contention of some breeders that maiden and younger ewes have a different period of pregnancy to that of older ewes was only very slightly supported by the evidence from the tests.

Factors Influencing Multiple Births.

Prolificacy is a characteristic that has been developed by stud breeders and is possessed by the different breeds in varying degree. The Dorset ranks very high in Australia for its prolificacy.

The compilation of lambing records at Wagga in 1941-42 enabled interesting information on multiple births to be obtained. The average occurrence of multiple births during the 1942 season, from ninety-seven ewes born during the autumns of 1935 to 1940, inclusive, was 32.2 per cent.

The following are the results of multiple births from each age group. Graph 2 further demonstrates the results obtained.

Birth Year ...	1935	1936	1937	1938	1939	1940
Multiple Birth Percentage. ...	33·3	25	35	27·2	59·2	13·3

The Influence of Nutrition.

One year's results from the ewes under test would indicate that with prolific breeds, nutrition during the growing period of the ewe's life could condition the subsequent occurrence of multiple births. The low incidence of multiple births for ewes born in 1935 to 1938 by comparison with those born in 1939 is most marked. During the years from 1935 to 1938, inclusive, seasonal conditions were most severe. The rainfall at Wagga Farm for these years was as follows:—

1935	..	1,742 points
1936	..	2,648 points
1937	..	1,600 points
1938	..	1,512 points
1939	..	2,824 points
1940	..	1,424 points
1941	..	1,703 points

It will be noticed that the 1936 and 1938 drop ewes have a remarkably low proportion of multiple births by comparison with other age groups, especially those born in 1939. Weaners in 1936 suffered badly from worm infestation, which, in addition to drought conditions which followed in 1937 and 1938, considerably checked their growth and development. In 1938 severe drought conditions necessitated hand feeding during lambing in autumn, and throughout the winter. The spring finished very early and a long, hot dry summer followed. Sheep dropped during this year, as in 1936, were considerably checked in growth and development. On the contrary, the season following the autumn of 1939 was one of the best for many years. Most sheep did excellently and the weaners thrived and developed into well-grown robust ewes. This was well demonstrated at classing for mating, by the general robustness of the 1939 drop ewes by comparison with the 1936 and 1938 drop ewes, despite rigid culling each successive year.

The low percentage of multiple births with the 1940 drop ewes is in accordance with the expectation from maiden ewes.

It isn't clever to talk of military matters.

It's Disloyal.

THE DEHORNING OF CATTLE

Has Many Advantages if Properly Done.

T. G. HUNGERFORD, B.V.Sc., H.D.A., Veterinary Officer.

THE dehorning of cattle is a procedure which has provoked much controversy in the past. No one will deny the economic advantages that result from removing the horns of cattle, but many stud breeders of both milking breeds, such as Ayrshires and Jerseys, and of beef stock such as Herefords and Shorthorns, claim that removal of the horns spoils the appearance of show animals; while others assert that dehorning adult stock is so painful that it should not be carried out.

It must be admitted that the removal of horns from adult cattle, even when correctly carried out, causes acute pain momentarily. Where sharp and heavy dehorning instruments are used, however, the pain inflicted is very transitory, and appears to be far less than that occasioned by milking a cow with a sore teat. It is certainly not nearly as severe as that suffered when one cow horns another, inflicting a rip in the hide or udder or in the area around the vulva—the most common sites. One has only to see some animals severely horned and trampled during trucking to realise the cruelty of trucking horned animals which are aggressive.

Shorthorn Calf Dehorned by the Author when it was 3½ Weeks Old.

The horn-buds were prominent and had almost burst through the skin. The left horn-bud needed only the first application (which was very vigorous); the right bud needed three more applications in the next week.

(*Photograph taken ten days after first application.*)

Incorrect methods such as the use of blunt dehorning instruments or the failure to supply sufficient manpower to "snap-to" the dehorner handles with one blow will cause unnecessary suffering, and such faults should be rigidly avoided. Sawing horns off at the butt is a barbarous, brutal procedure and should never be carried out unless under a general anaesthetic.

The Advantages of Dehorning.

The advantages of dehorning far outweigh any disadvantages. An animal which possesses its horns has full scope to vent any aggressive tendencies on other animals.

Horned cattle in the milking yards will frequently corner and horn the timid herd members, and if this bullying goes on there is a depression of milk yield in some cows as a result. Vigorous horning by a cow sometimes results in serious injury to the udder of another cow, and it is proverbial amongst dairymen that cows injured in this way are almost invariably some of the best producers in the herd. Further, it is not possible to pack the milking yards to their capacity with horned cows and to keep them under shelter in wet weather to allow them to dry out.

The Same Calf One Month After Dehorning.

There is complete absence of horn development and the scars have healed. The animal has since matured without trace of any horns.

The removal of horns from pugnacious bulls has a remarkable effect in rendering them safer to handle, and this advantage is not inconsiderable.

When travelling stock by road it is frequently noted that if they are watered at a trough, some animals, as soon as their thirst is satisfied, promptly attack their neighbours, causing injury and frequently damage to the troughing. This is avoided if stock are dehorned.

As a result of horning during trucking there is often marked depreciation of value of the carcases in consignments received at abattoirs, apart from the horn tears in the hides which cause considerable losses. When trucking cattle it is usually possible to include one more animal in each truck if they are dehorned. What is more important, however, is that hornless cattle in a truck can raise their heads after lowering them, whereas if an animal with wide horns gets its head down, it may have extreme difficulty in raising it again. This is frequently the cause of animals going down in a truck, and once down severe injury usually occurs.

An Improvised Dehorning Crush and Bail.
Any farmer can build such a structure, which is easier to use for dehorning than a milking bail.

It is claimed by a well known authority of beef production that dehorned steers under station conditions mature six months earlier than similar horned steers.

When dairy cows are dehorned, the change in the habits of the herd is noteworthy. On turning dehorned cows into a crop, they tend to behave like sheep. If horned they frequently make playful rushes at one another and consequently spread out and trample the crop. Close concentration of cattle on areas of pasture by the use of electric fencing, etc., is much easier with dehorned than with horned cattle; this practice is highly significant in making the maximum use of dung, maintaining soil fertility and preventing soil erosion.

In the light of these many advantages of dehorning it is felt that show judges who penalise dehorned pedigree stock should modify their attitude in the interests of national economy.

A Typical Experience.

The following typical experience of the value of dehorning came under the notice of the author. In the case of a Jersey herd of two hundred high-class animals, continual bullying occurred in the yards and frequently cows were injured. Dehorning of all adult cows was carried out. It did not put them off their milk to any appreciable extent, and wound sites healed completely in three weeks. The owner claimed that, not only were the cows then much more placid, but an appreciable increase in production resulted. To an outside observer the placidity of the herd was in marked contrast to the behaviour prior to dehorning.

Tipping.

Some owners adopt the habit of cutting the tips off the horns. Whilst this may minimise the damage inflicted by a pugnacious beast, it does nothing to reduce that animal's pugnacity, and is a very poor substitute for dehorning. Some owners tip the horns so far back that some of the sensitive core is removed, resulting in bleeding. The animal learns in the next few weeks that use of the horns causes pain, and this may teach the animal hesitancy. However, this effect usually wears off in six months, so that, at best, the benefits of tipping fall far short of complete dehorning.

Polled Steers.

The best dehorner is a polled bull. Polledness is a genetically dominant character and a true polled bull will "get" only polled progeny when mated to horned cows. Some of the male progeny may have small scurs. It should be noted that if these polled animals are interbred they will produce roughly three polled calves to every one horned calf, in accordance with the well-known pattern of inheritance set out in Mendel's laws.

Polled breeds available are Aberdeen Angus, Polled Shorthorn, Red Poll and, in other countries, Polled Herefords, Polled Jerseys and polled strains of other breeds are available. It is to be hoped that the breeding of the polled variety of all breeds will be encouraged in future.

Dehorning Calves.

The best method is to prevent the growth of horns in the calf. This should be carried out when the calf is very young—the earlier the better. The earliest age will depend upon breed characteristics, and, to some extent, the development of the calf. Usually the best period is when the calf is one to five days old, and preferably the calf should be less than ten days old.

Snip the hair from off the horn-bud or button in a circular patch about half an inch in diameter, and smear the area surrounding this patch liberally with some grease, such as vaseline, care being taken that no grease gets on the actual horn-bud. A stick of caustic potash (caustic soda may be used) should then be taken, moistened, and rubbed with firm pressure on to the horn-bud. The stick should be wrapped in paper or placed in some holder, and it should not be moistened on the tongue.

The rubbing should be continued for perhaps a minute, but this will depend on the firmness of the pressure exerted. After momentary rubbing the skin is seen to disintegrate, and gradually a raw, moist area is produced. After doing several calves the farmer will have a good idea of how

far one must proceed to destroy the future formation of the horn. Incomplete destruction of the horn may result in twisted, dwarfed or "snaily" horns.

The calf should be kept under close observation, and the moment any tendency for the horn-bud to reform is noticed a further rubbing with the caustic stick will complete the dehorning.

Dangers of this Method.

If the rubbing is too prolonged, deep sloughing of the tissues may occur, producing an unsightly wound and some pain. In some cases, copious weeping of lymph from the treated area occurs, and should such fluid gain access to the eye the dissolved caustic potash may cause serious inflammation. This is particularly likely to happen when the greasing of the calf's head leaves a strip of greased hair near the eye so that the fluid may run along the edge of it into the eye.

Dehorning Young Stock.

On a beef cattle station it is mostly quite impractical to debud the stock by the caustic method, as, in most cases the drop of calves is not seen until the time of the branding muster, when the ages will vary from a few days old up to perhaps five months. Dehorning may be carried out at this stage using either a "gouge" (a type of instrument which gouges out the horn-bud) or the ordinary adult dehorners. At this early stage the horn is a skin structure, and it may not become connected with the bone until the animal is about three months of age. At from five to six months the cavity of the frontal sinus of the head extends into the horn to form the horn cavity.

It will, therefore, be seen that before three months of age, surgical removal of the horn-bud is a simple matter. At any stage before five months, removal of the horn with dehorners as used for adult cattle is a safer and simpler procedure than with adult stock as it does not involve the opening of the frontal sinus.

Dehorning Adult Cattle.

Much apprehension as to the consequences of dehorning is felt by many owners of dairy herds; they fear that the health of the stock will be affected and there may be a serious falling off in milk production. An experience of dehorning in a commercial herd carried out by the author during semi-drought conditions is cited as a typical case for the guidance of those intending to dehorn.

The herd comprised eighty head of Australian Illawarra Shorthorns or crossbreds, about sixty of which were milking. Dehorning was carried out in an improvised crush and bail made from old timber and erected in the milking yard. No action was taken to check bleeding, except in the cases of animals which were still spurting blood after twenty minutes; the treatment is described later in the article. After dehorning the cows were let out to walk about 10 yards to the feeding bails, and in every case they walked rapidly or trotted across and immediately started to feed.

Dehorner in Position.

In practice two men operate this instrument, but one stood aside to enable the photograph to be taken.

The effects of dehorning in this herd were as follows:—Five cows out of the eighty showed some discharge of serum or pus from the horn cavities. Most of these showed symptoms for only one to two days, usually commencing about the fourth or fifth day. One cow continued for seven weeks, but the remainder were normal by the eighth day after the operation.

There was slight diminution of milk yield in some of these cases, but no detectable difference occurred in the milk yield of the rest of the herd. The owner, who was hesitant about dehorning his cattle, has since become a staunch advocate—as a result of the increased docility and milk production of the herd.

The Dehorner Snapped Closed.

Dehorning Instruments.

Various dehorning instruments are on the market, but only those which are massive in type and which lend themselves to a prompt clean removal of the horns should be used. Instruments which are flimsy, difficult to handle, or which do not permit the easy shearing of the largest horn with one rapid compression should not be used. If a faulty instrument is used so that the operator has to make several attempts before a horn is removed, the animal is caused unnecessary pain.

A suitable crush about 2 feet or 2 feet 4 inches wide, which allows passage of the largest cow but will not allow any cow to turn round should be erected with an ordinary sword-stick bail at the end, and a stout post should be placed in position so that the animal's head can be drawn through and tied securely to one side. Several halters should be available.

Cutting-off the Horns.

Run the animal into the bail, secure the head, place the dehorners over the very base of the horn including a narrow circular strip of skin. If the animal can it will naturally wave its horns

Arresting Bleeding.

If bleeding continues for twenty minutes, a piece of string is looped around the poll and drawn tight enough to check the spurt of blood. It is removed in half-an-hour.

about, and the operators should pause until the dehorners are exactly adjusted and then snap the horn off with one swift blow. To close the handles of the instrument in this manner it is preferable to have two men, each having a hand on each handle.

It cannot be emphasised too strongly that any hesitation will result in mangling of the tissues and will cause unnecessary pain. Where the horn is snapped off rapidly it seems to numb the area, and many animals give a mild shake of the head and nothing more.

Immediately after removal of the horn, blood will spurt from a number of arteries, usually about four on each side.

These spurt out about 18 inches from the head. No notice should be taken of this, but the animals should be released into a small yard close handy and examined twenty minutes after the dehorning. Animals which are bleeding after this period should be run back into the crush, and a stout piece of string placed around the poll (the area at the base of the horns) and tightened as a ligature. As the slip-knot of the string is pulled tight the spurting and oozing of blood ceases. The ligature should be removed after half an hour; leaving for longer periods will delay healing. Experience suggests that 5 per cent. of animals dehorned should need to be treated in this manner.

The loss of blood does not appear to cause a decline in milk yield in most cows, even on the day of dehorning, as long as they have ready access to water after the operation. In the case of the few cows which do show a drop in production, it is usually made up in one or two days.

Antiseptic Precautions.

The dehorning instruments should be soaked overnight in a strong solution of disinfectant, *e.g.*, 10 per cent. lysol, and between use on animals should be deposited in a bucket of dilute disinfectant, *e.g.*, 2 per cent. lysol. Strict cleanliness should be observed.

The wounds are best left alone. If flies are particularly bad it may be advisable to smear a fly repellent *around* the wound. Do not place any of it actually on the wound and take particular care to see that none enters the horn cavity. Suitable fly repellents are those prepared as sheep dressings, *e.g.*, B.T.B. 15, C.B.E. or Boracic Acid Co (further details of these may be obtained from the Department on application).

When dehorning is followed by the application of routine dressings, particularly if such dribble down into the frontal sinus, an inflammatory condition may develop with discharges from the sinus for many weeks. Even when dehorning is carried out correctly, odd cases may occur where there is some inflammation and discharge from the frontal sinus, but these are rare.

Some "Don'ts" to be Observed.

Don't place any dressing on the wound. "Soothing dressings" hinder healing and irritant dressings hinder it to a greater extent. A healthy blood clot is by far the best dressing and is non-attractive to blowflies. The application of Stockholm tar, Stockholm tar mixtures, kerosene, turpentine and other home remedies tends to promote pus formation, and the area becomes highly attractive to fly strike.

Don't place any plug, for example, tow or cotton wool, in the horn cavity. Such plugs become adherent to the mucous membrane, and their removal after several days causes intense pain —far greater than that caused by dehorning. Plugs have been seen still in position as long as three months after dehorning, and they have

formed a centre of necrotic bone and pus. Dehorning is often criticised as a result of the mistaken zeal of operators who insist on applying dressings and plugs.

Don't operate in very dusty yards if it is possible to avoid it (water down, or dehorn in milking bails).

Don't dehorn in wet weather. The rain washes the blood clot and debris into the frontal sinus and causes suppuration.

Don't allow the dehorning blade to become blunt. Touch up with a suitable file or oilstone after every fifty cows.

Don't use flimsy dehorners or an instrument that is too small to allow two men to operate on the handles at once.

Don't have the cow tied up so that she can wave her head about and so jag the horn-butt on the sharp edge of the dehorners before they are fully in place.

Don't disbud calves in herds of adult cattle which are not dehorned, or the youngsters will never get a fair chance at the feed and will not develop normally.

It is particularly harmful to dehorn portion of the herd leaving the rest with their horns. The defenceless animals become "cowed" and bullied by the others. Do not place freshly dehorned amongst those which have not been operated upon as the smell of blood will stir up the other animals that have not been handled.

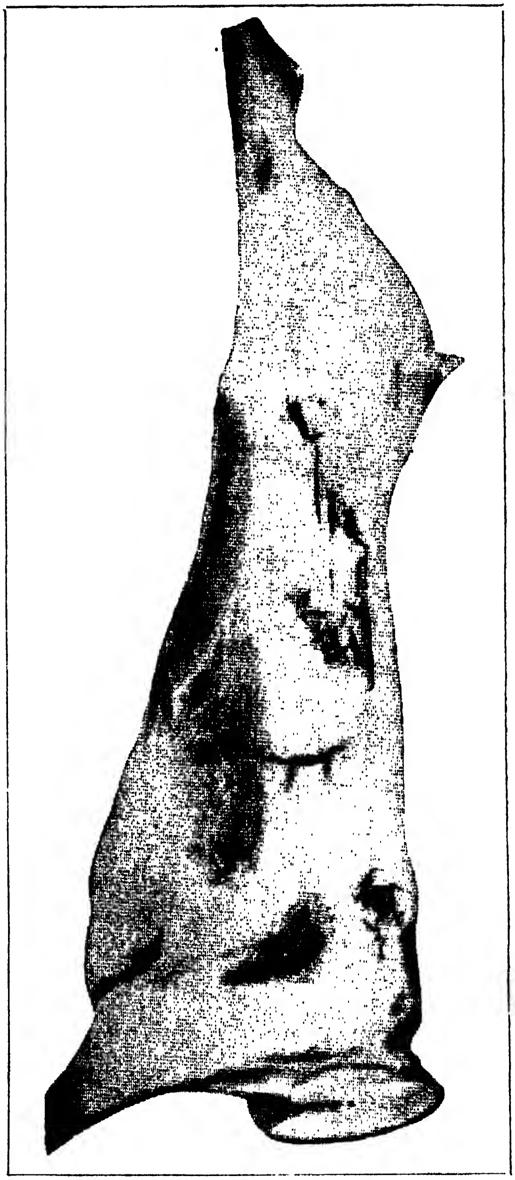
Dehorning of Bulls.

The large horns of bulls may be difficult to remove with the dehorning instrument, and in any case the pain occasioned is very considerable. A veterinarian should, therefore, be consulted. Local anaesthesia is easy to carry out and the veterinarian can block the branch of the nerve (Lachrymal) which supplies the horn. This can, of course, be done for all animals, but in the author's experience in the case of cows the insertion of a needle through the skin in this area causes more pain than snapping off the horn.

Conclusion.

Dehorning is profitable; it can be carried out by the farmer, but every care should be taken to follow the procedure outlined above to avoid unnecessary suffering. Sawing off horns without the previous administration of anaesthetic is a brutal proceeding.

After the initial dehorning of adults, all calves should be disbudded during the first few days of life.



Carcase Showing Injuries Inflicted by Horning.

Big Increase in Milch Goats in Holland.

CONFISCATION, disease, shortage of feeds and ruthlessly enforced slaughter of dairy herds have caused a serious shortage of milk in Holland. The keeping of milch goats in greatly increased numbers is helping to overcome the problem. It was recently estimated that there are at least 20,000 goats in Holland. A milch goat costs to-day between £12 and £25. According to the Netherlands Indies Government Information Service, one farmer recently disposed of five pedigree goats and a lamb for £200.

Help Win the War. Buy War Savings Certificates.

FEEDS and FEEDING NOTES.

FEEDING DAIRY CATTLE.

(*Concluded from page 27.*)

G. L. McCLYMONT, B.V.Sc., Veterinary Officer.

IN last month's Notes, the application of simple economic and nutritional principles to the feeding of dairy cattle when using home-grown feeds was discussed. The concluding portion of the article, which follows, indicates the application of these principles to the problem of economic milk production under circumstances where roughage is either more expensive than concentrates on a starch unit basis, or is in short supply.

When Roughage is Expensive.

The most economical method of feeding in these cases where roughage is expensive or scarce would be to feed all concentrates and no roughage. However, roughage is essential for normal digestion, and in practice it has been found best to allow the maintenance requirements as roughage and use concentrates to bring the nutritive level up to requirements. Thus, the following amounts of roughage approximately cover the maintenance requirements of a 900 to 1,000 lb. cow, *i.e.*, provide about 6 starch units and 0.6 protein units.

Good silage .... 50 lb.
or
Good quality lucerne chaff or hay.... 14 lb.
or
Good quality oaten or wheaten chaff or average lucerne chaff .... 16 lb.

Where roughages are extremely expensive or scarce, the quantity may be reduced to about 20 to 30 lb. of silage or 10 to 12 lb. of chaff and concentrates used to bring the level up to the maintenance requirements. Thus, 10 lb. of oaten chaff and 3 lb. of oats could be used as a maintenance ration.

The Production Side of the Ration.

If the table showing the nutritional requirements for production of 1 gallon of milk of different fat contents is studied, an interesting fact will be noted, namely, that the ratio of starch to protein units is always in the ratio of 5 to 1. For example, for the production of a gallon of 3.8 per cent. fat content milk, 2.5 starch units and 0.5 protein units are required. The ratio in this case of starch to protein units is 5 to 1. Similarly for a gallon of 4.8 per cent. fat content milk, 3.0 starch units and 0.6 protein units are required, again a 5 to 1 ratio.

Accordingly if a mixture of concentrates is prepared with a starch to protein unit ratio of 5 to 1, this can be fed as the production portion of the ration without having to worry further about "balancing." In the following table, the common starch and protein concentrates have been listed, and the proportion of each to be used when making up balanced concentrate mixtures shown, together with the amounts of the mixtures to feed per gallon of 3.8 per cent. fat content milk. (The amounts of the production mixtures for milk of higher fat values may be found by adding ¾ lb. meal for every 1 per cent. of fat above 3.8 per cent. For example,

5.8 per cent. fat content milk would require $3\frac{1}{4} + 2 \times \frac{3}{4}$ lb., *i.e.*, 4¾ lb. of maize-linseed meal mixture per gallon.)

Starch Concentrate.		Protein Concentrate.		lb. of mixture or feed per gal. of 3·8 per cent. fat content milk.
Foodstuff.	Parts By weight	Foodstuff.	Parts By weight	
				lb
Maize	5	Meat meal .	1	3¼
Maize	4	Linseed meal	3	3¼
Maize	7	Peanut meal...	2	3¼
Wheat or Barley ..	6	Meat meal ...	1	3½
Wheat or Barley ..	3	Linseed meal	2	3½
Wheat or Barley	4	Peanut meal...	1	3¼
Oats	7	Meat meal ...	1	3¾
Oats ..	2	Linseed meal	1	3¼
Oats	6	Peanut meal...	1	3¾
Pollard	12	Meat meal . .	1	3¾
Pollard	4	Linseed meal	1	3¼
Pollard	8	Peanut meal..	1	3¾
Bran		....	...	5
Cocoanut meal	..	..	...	3¼

Use of Production Mixtures.

The direct application of these production mixtures to feeding will almost certainly lead to disappointment, as whilst a mixture of starch and protein concentrates may be balanced the mixture is not necessarily palatable or of a suitable texture. Thus, wheat 4 parts and peanut meal 1 part, whilst balanced, would not be a suitable concentrate mixture, owing to its "mealiness" or "heaviness." Bran, even though it may be a little dearer per starch unit than the mixture, would be indicated as a leavening food for the mixture, so that a suitable mixture could be—wheat, 4 parts, peanut meal, 1 part, and bran 3 parts (the proportion of bran does no alter the balance of the mixture as it is a self-balanced feed itself).

Similarly, crushed oats might be available at a slightly higher cost per starch unit than barley, with linseed meal as the cheapest protein concentrate. A production mixture of suitable texture could then be made up as follows:—

{ Crushed oats .... 2 parts
{ Linseed meal .... 1 part

{ Crushed barley .... 3 parts
{ Linseed meal .... 2 parts

that is crushed barley, 3 parts, crushed oats, 2 parts, linseed meal, 3 parts. The amount per gallon of 3.8 per cent. fat content milk would be an average of 3½ lb. per gallon (barley mixture) and 3¾ lb. per gallon (oats mixture), that is about 3⅝ lb.

Mixtures of protein concentrates can also be used if they are about equal in price, thus a production mixture of suitable texture could be made up as follows:—

{ Maize .... 5 parts
{ Meat meal .... 1 part

{ Maize .... 7 parts
{ Peanut meal .... 2 parts
Bran .... 5 parts

That is, maize, 12 parts, meat meal, 1 part, peanut meal, 1 part, bran, 5 parts. The amount per gallon would be an average of 3¼ lb. (maize, meat meal mixture), 3¼ lb. (maize, linseed meal mixture) and 5 lb (bran), that is 3¾ lb. per gallon of 3.8 per cent. fat content milk.

Another method of using these production mixtures so as to produce palatable rations is as follows:—Having provided roughage as the maintenance, use the cheapest mixture which may not be very palatable, to provide the nutriments for the first one or two gallons of milk, but use some leavening concentrate as bran or oats mixture, which may be a little dearer, to provide the nutriment for at least a proportion of the milk production. Thus a ration for a 2 gallon, 1,000 lb. cow could be—

MAINTENANCE: Lucerne chaff, 14 lb.

Production of 1st gallon of milk—3½ lb. of wheat, meat meal mixture.

Production of 2nd gallon of milk—5 lb. bran.

Another ration, using oats as a leavening concentrate could be, for a 1,000 lb. cow giving 3 gallons of 4.8 per cent. fat content milk—

MAINTENANCE: Sorghum silage, 50 lb.

Production of first 2 gallons of milk—8½ lb. of barley-peanut meal mixture.

Production of third gallon of milk—4½ lb. of oats-peanut meal mixture.

Example of Use of Production Mixtures.

Take a case where barley is the cheapest starch concentrate, linseed the cheapest protein concentrate, and bran about equal in cost per starch unit of the mixture. Limited oaten chaff is also available. A ration for a 1,000 lb. cow giving 2 gallons of 3.8 per cent. milk could then be:—Maintenance: Oaten chaff, 16 lb. Production: Mixture of linseed, 2 parts, crushed barley, 3 parts, bran, 2 parts; fed at 4 lb. per gallon, *i.e.*, 8 lb.

Dry matter in the ration would be about 24 lb. For a 3-gallon cow another 4 lb. of the mixture could be used, bringing the total dry food intake up to 28 lb., and for a 4-gallon cow another 4 lb., bringing the total dry food intake to 32 lb; that is, about the average limit of capacity for a cow of this weight.

For a 5-gallon cow, the dry food intake in this case would be about 36 lb., and this is where the feeding of the high producers becomes a more or less individual problem, as some cows would eat this amount of dry food but it would be beyond the capacity of others. Thus for cattle giving 5 gallons or more per day it may be necessary to decrease the quantity of roughage to a minimum of about 10 lb., so that a 6-gallon cow could receive 12 lb. of roughage and about 24 lb. of concentrates, *i.e.*, about 36 lb. of dry food. As mentioned already, even this may be beyond the capacity of the cow, though with high producers the dry matter capacity is often considerably larger than that of cattle of lower production. The loss in nutriment entailed in this decrease of roughage in the ration can usually be ignored, as apparently much of the heat developed in the digestion of this large amount of concentrates is used for maintenance purposes.

To help ease the load on the digestive system of high producers requiring heavy feeding, feeding three times a day instead of the usual two may be found to be an advantage.

Other rations using a minimum of roughages for a 1,000 lb. cow giving 3 gallons of 3.8 per cent. fat content milk are as follows, the first three being based on production mixtures and the other two being worked out by trial and error:—

10 lb. oaten chaff } Maintenance.
3 lb. oats }
7½ lb. pollard–linseed meal mixture.
5 lb. bran.

50 lb. maize silage.
5 lb. bran.
7 lb. peanut meal–crushed wheat mixture.

14 lb. lucerne chaff.
3½ lb. cocoanut meal.
6½ lb. maize–linseed meal mixture.

	Starch Units.	Protein Units.
12 lb. grass hay	4·7	0·48
5 lb. barley bran	3·2	0·45
8 lb. crushed oats	5·0	0·64
1 lb. meat meal	0·8	0·55
	13·7	2·12
10 lb. good lucerne hay	4·5	0·9
30 lb. brewer's grains ...	5·4	0·6
6 lb. pollard	4·0	0·6
	13·9	2·1

Feeding the Dry Cow.

Feeding cattle whilst they are not actively producing milk is sometimes regarded as unprofitable, but, as indicated earlier, adequate feeding during the dry period is essential for maximum production. In England a system known as "steaming up" is in vogue, whereby for a period of about six weeks before calving cattle are fed increasing quantities of feed till at calving they may be being fed at a "2-gallon" rate, *i.e.*, sufficient food to supply the nutriment necessary for maintenance and production of 2 gallons of milk.

One British recommendation for dry cows is as follows:—

3 lb. balanced concentrate during 6th week before calving.
4 lb balanced concentrate during 5th week before calving.
5 lb. balanced concentrate during 4th week before calving.
6 lb. balanced concentrate during 3rd week before calving.
7 lb. balanced concentrate during 2nd week before calving.
9 lb. balanced concentrate during 1st week before calving.

Results indicate that the practice, as it induces a heavy flow of milk, more than pays for itself.

Adequate feeding before calving fills three functions, viz.:—

(*a*) Provides for growth of the unborn calf, most of which takes place in the last three months of pregnancy.

(*b*) Allows the milk secreting glands of the udder (which are largely protein) to be built up to their maximum extent.

(*c*) Provides a reserve of protein and fat for milk production.

The maximum development of milk secreting glands and a reserve of protein and fat are the two conditions which enable a cow to produce her "genetic maximum" or the maximum amount of milk that her inherited capacity for milk production allows. If only a maintenance, or fattening, *i.e.*, low protein though high starch diet is fed, the udder, especially of heifers, will not develop to its maximum, and milk production will not rise to its maximum when the cow calves.

This "steaming up," as it induces a heavy initial milk flow may tend to produce cases of milk fever, which may be guarded against to some extent by allowing adequate calcium and phosphorus as a lick or as a supplement during the dry period.

A few days before calving, concentrates, if being heavily fed, should be reduced, and laxative feeds as bran and linseed meal given if there is any indication of constipation. After calving the ration should be gradually increased till the estimated ration that is required is reached after several days.

As the milk yield increases for 6 to 10 weeks after calving the concentrate allowance should, if maximum production is to be obtained, exceed the calculated requirements by 1 or 2 lb. per day so that the cow will be able to produce her maximum without loss of condition. When the peak has been passed decrease the ration as the milk flow decreases.

The following table lists the commoner cattle feeds and indicates their food value in starch and protein units. Taking into consideration all points discussed in the series of articles on dairy cattle feeding, this table will be a valuable aid in working out economic and nutritionally sufficient rations.

TABLE OF FOOD VALUES.

Feed.	Starch Units (lb. of Starch Equivalent). Per 100 lb.	Starch Units (lb. of Starch Equivalent). Per cwt.	Protein Units (lb. of Protein Equivalent) per 100 lb.	Ratio Starch Units to Protein Units.	Comments.
			Dry Roughages.		
Lucerne hay or chaff ...	35-45 (Average 40).	40-50 (Average 45).	7-11 (Average 10).	5	Valuable content of calcium and vitamin A. Quality varies according to proportion of leaf, colour, and stage of growth. Very low quality material may not have the food value of straw.
Oaten or wheaten hay ...	33	37	3·5	10	Quality also varies. Figures are for average quality. The grain content influences the food value to a large extent.
Oaten or wheaten chaff ...	40	45	3·5	10	
Clover hay ...	38		8	5	All hay from grass and clover depends for its quality on stage of growth when cut (best cut young), efficiency of curing and storage and proportion of leaf.
Grass hay ...	36	...	4·0	10	
Grass and clover hay (mostly clover).	38	...	7·0	5	
Oaten straw ...	21	...	0·6	35	Of value only when other roughage not available or too dear, and more valuable in cold weather owing to heat expended in digestion.
Wheaten straw ...	13	...	0·1	130	
Barley straw ...	23	...	0·7	32	
Flax boll chaff ...	22	...	7·0	3	By product from preparation of linseed plant for oil production.
Oat hulls ...	21	...	0·4	50	A useful roughage at times when hay and straws dear.
Rice hulls ...	3	...	0·3	10	Practically no food value and not worth buying at any price.
Wet brewers grains ...	18	...	4	4·5	Owing to water content and bulky nature is a roughage, but high protein content makes it practically a self-balanced feed which can be fed at 14 lb. per gallon of milk. If very heavily fed on them for long, cattle may go off feed, but up to 30 lb. per day is a safe allowance.
			Silage.		
Pasture (mostly clover) ...	16	..	3·0	3	The food value of silages varies a great deal, the moisture content being a big factor. For very moist or dry silages the food value should be lowered or raised by about 4 starch units. Stage of growth, colour, and type of fermentation have a marked bearing on the food value.
Pasture (mostly grass) ...	10	...	2·0	5	
Maize, sorghum, millet (70 per cent. moisture).	12	...	1·5	8	
Oaten, wheaten, barley	13	..	1·5	9	
Lucerne ...	13	...	3·0	4	
			Green Feed.		
Rotationally grazed mixed pasture.	14	...	4·5	3	The value of young mixed pasture and the loss of nutriment as pasture matures is evident.
More mature mixed pasture	14	...	2·5	6	
Mature paspalum ...	11	...	1·5	8	
Lucerne ...	12	...	3·0	4	The fact that the total food value of green crops does not appear to be high is not due to low digestibility but to comparatively high content of water.
Oats, wheat, barley ...	10	...	2·0	5	
Maize, sorghum, millet ...	9	...	1·0	9	
Rape ...	7	...	1·5	5	
			Root Crops.		
Mangolds ...	7	...	0·7	10	If not grazed, best fed sheed. Quantities of 30-60 lb. most economical.
Potatoes ...	18	...	1·0	18	
Swede Turnips ...	8	...	0·8	10	
Pumpkins ...	7	...	0·5	14	
			Starch Concentrates.		
		Per Bushel.			
Maize... ...	78	44	8·0	10	Feed coarsely crushed, with bulky feeds as chaff silage, bran or crushed oats. Wheat may also be rolled and is probably then more easily fed, but it should not form more than one-half of the concentrate mixture.
Wheat ...	72	44	8·0	9	
Barley ...	71	36	7·0	10	
Oats ...	63	25	8·0	8	Feed crushed or rolled.
Sorghum ...	70	...	6·0	11	Feed crushed.
Millet... ...	62	...	9·0	7	Feed crushed.
Husked rice ...	82	...	6·0	14	Feed crushed.
Wheat pollard ...	66	...	10·0	7	A palatable and fairly bulky feed.
Barley bran ...	64	...	9·0	7	Apparently at times not very palatable.
Hominy meal ...	78	...	8·0	10	A product of maize and similar in composition, but more bulky.
Oat bran ...	50	...	4·0	12	A useful bulky food.
Molasses ...	50	...	1·2	40	Useful to accustom cattle to new feed. Usually too expensive to use regularly as a feed.
			Protein Concentrates.		
Meat meal (60 per cent. crude protein grade, 12 per cent. fat).	84	...	55·0	1·5	Animal by-products are sometimes unpalatable and it may require skilful feeding to accustom cattle to them. Are often very cheap protein concentrates.
Meat and bone meal ...	60	...	30·0	2	Contains a large proportion of bone so that if fed, bone meals not necessary.
Blood meal ...	63	...	68·0	1	Rather unpalatable.
Liver meal ...	94	...	58·0	1·6	....
Fish meal ...	53	...	60·0	1	Extensively used in Britain, but not much available here as yet.
Linseed meal ...	72	...	25·0	3	Very palatable and has useful laxative action.

TABLE OF FOOD VALUES—*continued.*

Feed.	Starch Units (lb. of Starch Equivalent). Per 100 lb.	Starch Units (lb. of Starch Equivalent). Per cwt.	Protein Units (lb. of Protein Equivalent) per 100 lb.	Ratio Starch Units to Protein Units.	Comments.
			Protein Concentrates—continued.		
Soybean meal	70	...	38·0	2	Very little available here as yet. Extensively used in the United States of America.
Peanut meal...	76	...	42·0	1·8	Very palatable feed.
Cottonseed meal	70	...	36·0	2	Very little available in New South Wales. Extensively used in the United States of America.
Maize gluten feed	78	...	20·0	4	Not very palatable at times.
			Self-balanced Feeds.		
Wheat bran	54	...	10·0	5	Valuable for its ability to improve texture of ration and for laxative action.
Cocoanut meal	76	...	15·0	5	Very palatable feed.
Lucerne meal	50	...	11·0	5	Valuable for its vitamin A content.
Palm kernel meal	73	...	15·0	5	A palatable oilmeal.

Current Feeding Costs.

LITTLE change in price of feedstuffs has taken place during the last month, but the commoner feeds are quoted in the list at their current prices.

As has been the case for several months, chaffs are still more expensive as sources of food matter than grains. For example, oaten chaff at £6 10s. 0d. per ton is nearly twice as dear as a source of food material as wheat at 3s. 4d. per bushel.

Maize is much too expensive at present prices for stock feeding purposes, being over twice as dear as wheat as a source of food. Thus the practice of maize growers of selling their maize and buying wheat for pig feeding is well warranted. Nevertheless, in spite of the high cost of maize and maize meal, some men still continue to use them for feeding purposes, apparently habit or tradition overriding cost considerations. This practice, whilst inexcusable from the point of view of economic stock feeding, is a symptom of the viewpoint of men who still regard each feed as being possessed of qualities not possessed by other feeds, instead of regarding them all as sources of food material which, where necessary, can be substituted for each other. Of course, all feeds have certain characteristics, and a knowledge of these is necessary for successful feeding, but their importance is, on the whole, comparatively small and should not obscure the realisation that feeds are, to a very large extent, interchangeable if food values, *i.e.*, starch units and protein units per 100 lb., are taken into consideration.

Feed	Starch Unit value per 100 lb.	Protein Unit Value per 100 lb.	Cost.	Cost per Starch Unit.	Cost per Protein Unit.	Comments.
Lucerne hay or chaff (good sound).	35–45 (Average quality 40).	10	£8 per ton*	2·1d.	...	Chaffs still dearer than grains as sources of food matter so that minimum amounts of chaffs should be fed to cattle and horses and a maximum amount of grains used.
Oaten chaff (good sound).	40	3	£6 10s. per ton* ...	1·7d.		
Wheaten chaff (good sound).	40	3	£6 10s. per ton* ...	1·7d.		
Oats	62	8	2s. 4d.–2s. 8d. per bushel	1·1d. 1·3d.	...	Oats a cheap feed.
Crushed oats ...	62	8	3s.–3s. 4d. per 40 lb. ...	1·4d.–1·6d.		
Maize	78	8	8s. 3d. per bushel ...	2·3d.	...	Maize and maize meal are expensive foods and supplies short.
Maize meal	78	8	£16 per short ton† ...	2·5d.		
Wheat	72	8	3s. 4d.–3s. 8d. per bushel	0·9d.–1·0d.	...	Wheat the cheapest feed and ample supplies available.
Wheat meal ...	72	8	£7 per short ton† ...	1·2d.		
Barley	71	7	3s. per bushel	1d.	...	Barley practically as cheap as wheat.
Barley meal ...	71	7	£7 per short ton† ...	1·2d.		

* Long ton = 2,240 lb. † Short ton = 2,000 lb.

War Gossip is Dangerous. Guard Your Tongue.

The Wholesale Feeding of Bees.

Methods Used in the Past Season.

THE difficulties associated with the wholesale feeding of bees which became necessary during the recent adverse conditions created a very serious problem in many apiaries. The failure of the flowering plants to produce sustenance for the bees, which was brought about by insect infestation of the blossom and the diversion of the plant substances to the making of extensive new foliage growth, could not be foreseen, and consequently bee-farmers were not prepared for extensive emergency-feeding operations.

The reserve of feed-honey on the farms was quite inadequate, and there was an urgent call for supplies of sugar to make a substitute syrup-food; very few useful feeders were available and tins for use as substitutes were scarce. These troubles, combined with a shortage of competent assistance, made it very difficult to feed a large number of colonies by usual methods. Experience on this occasion, however, may prove useful in overcoming similar problems should they arise in the future.

A Simple and Economical Scheme Used at Hawkesbury College.

At Hawkesbury Agricultural College it was found impossible, during these adverse times, to provide for the insertion of feeders in all individual hives, and to devote sufficient time for such artificial feeding—the procedure that would have been adopted under ordinary circumstances when some stimulation of a number of colonies or the supplying of additional food to a section of the apiary became necessary. For the wholesale feeding of the colonies it was found necessary to adopt a more simple and economical scheme. Resort was made, therefore, to giving heavy supplies of syrup to a number of well-populated colonies for storage in combs in their own hives. When filled these combs were removed and distributed amongst the needy stocks.

In preparation for the feeding, an additional full-depth hive-body, and five large "Alexander" feeders, were placed on top of each selected hive. The feeders were first placed in position, resting on the top frames in the feeding hive. Owing to their length, it was necessary to fit them angle-wise, and one directly over the other. To provide free entry for bees in this position, two short slats of board about ⅜ inch thick were placed between the feeders, being set wide enough apart to give a firm seating for each feeder resting on them, as shown in Fig. 1.

A syrup composed of sugar and water, equal parts by volume, well-stirred and brought to boiling point, then allowed to cool until luke-warm was used as a food-supply. This syrup was poured from a large jug into the first feeder when in position; then the two slats of board were put in place, and over these another feeder was set and filled, the filling being continued until all five were complete.

It was found that each colony could deal with four feedings given at regular intervals in a day, the total quantity being approximately 20 lb. in weight. Following a few days of such intensive feeding, a large number of combs heavy with processed and partially processed food were available for distribution where required. Empty combs, removed from the needy hives to make room

Fig. 1.—Set-up of Feeders and Method of Filling.

for full ones, were placed with the feeding colonies so that they in their turn could be filled.

The feeders of the "Alexander" type were employed at the College simply because they happened to be available and were handy for the purpose. Any makeshift vessel might have been used, provided necessary precautions were observed to insert some floats in them to prevent risk of bees being drowned during their rush to take up the syrup. Larger containers could be employed if desired, and the total quantity of food given in, say, two feedings—one early in the morning and the other during late afternoon. However, a number of medium-sized

Fig. 2.—Feeders in Position in New Hive Body.

feeders is preferable to a single large one, as they tend to induce a better distribution of the force of visiting bees. Much depends, however, on what is available when such emergency arises.

Advantages of the College Method.

With the feeding plan used at the College there was less inducement for bees to develop a tendency to rob, such as might occur if individual feeding with syrup food or thinned-down feed-honey was carried out. This is important, as during adverse times bees need little inducement to make extensive robbing raids, and once they commence and have some success in securing ill-gotten gains, robber bees become very difficult to control.

Other important points noted during the feeding of the bees by this process were:—

(*a*) The combs of naturally-stored food given the needy colonies did not unduly stimulate brood-rearing, and this was a desirable feature at the time.

(*b*) The distribution of the combs was a simple procedure, occupying a minimum of time, and the colonies were not disturbed to any extent.

(*c*) Each comb contained a heavy quantity of food sufficient to tide the bees over a fair period of time.

(*d*) The food supplied was in a concentrated form, the strong-feeding colonies having reduced the moisture content of the syrup and inverted the sugar. As a result the benefits were found to be more lasting than those from an equal quantity of raw syrup.

Other Systems of Emergency Feeding.

In odd instances bee-farmers did not have any colonies in a sufficiently populous condition to employ them in a food-storage capacity, and inquiry was made at the Department concerning the best method for out-door feeding. Out-door feeding is not satisfactory, because it usually creates a good deal of excitement amongst the bees, and the wear and tear resulting from the scramble for supplies has a weakening effect on the vitality of the field force. Then again it may prove an expensive plan, as bees from anywhere within several miles around may help themselves to the supply. In some cases, however, it was necessary to feed all the colonies at the shortest possible notice to prevent actual starvation, and out-door feeding appeared to be the only feasible way.

The plan suggested was to set up a good-sized shallow vessel, such as an old tank cut down to within a foot or so of the bottom and made water-tight—or perhaps the liquefying vat from the honey house could be used—as a feeder in a shaded position 40 yards or more from the apiary. A plentiful supply of floats should be placed in it to prevent bees being drowned. To attract the bees in the first instance, a small quantity of the usual strength sugar syrup may be used first, the solution to be gradually weakened as the bees accept this method of feeding, until the low level of from seven to nine parts of water to one part of sugar is employed. This weak mixture is necessary in outdoor feeding to minimise the risk of creating an uproar of excitement amongst the bees, such as would occur if a stronger and more attractive mixture was supplied.

Another method employed by some bee-farmers for emergency feeding was to pour sugar syrup into empty combs, and distribute them where needed in the apiary. The filling of the combs was carried out indoors with the aid of a watering-can or with a fruit tin with a number of nail holes punched in the bottom, the combs being held at a slight angle over a tub or similar vessel while being filled. This is a "messy" job compared with the method used at the College, and provides more risk of causing excitement and tendency toward robbing amongst the bees.

CAGING QUEEN BEES.

Extreme Care Necessary.

THE Department's experience is that bee-farmers generally do not display sufficient care in handling queen bees. The usual practice in catching a queen for caging, so that she may be introduced to another colony or for mailing, is to grasp her by the wings, and push her head first through an opening made in the wire screen cover of the cage. Very often only one wing is held, and the queen turns and twists until the

Miller Introducing Cage.

wing is out of shape, and thus her form is spoilt. Then again the queen may double up and the hooks on her legs catch on the segment rings of the abdomen; this is likely to cause cramp and possible interference with her delicate reproductive organs. This damage may result even when both wings are held, unless the transference to the cage is carried out expeditiously by an experienced hand. Evidence of rough work is disclosed by examining a number of queen bees under a magnifying glass; one is surprised by the number found in the average apiary minus a hook on one or more legs. This could be caused by the queen being pulled from a rough surface of the hive, or comb, which she will naturally grasp to resist removal.

To avoid damage of the type indicated to a queen, it is recommended that on all

possible occasions she be trapped in a Miller type cage, by carefully placing the mouth of the cage over her. The queen will crawl up the side of the cage and may then be imprisoned by placing a finger over the opening to the cage. A little extra time may be taken occasionally in applying this method, compared with catching the queen by her wings and pushing her into a cage, but it is well worth while.

On an occasion when it becomes necessary to catch a queen by hand, it is a good plan to place her straight into the palm of the left hand and enclose her with the fingers, allowing ample space for her accommodation. The imprisoned queen may then be directed into the cage by making an opening between the thumb and first finger. A little practice with drones will provide useful experience and necessary confidence.

Experiences of Deferred Irrigation of Orange Trees.

THE following accounts of the effect of withholding water for lengthy periods from orange trees should be of interest and value to citrus growers in irrigated areas, particularly because many growers believe that such an experience would not only cause a total loss of crop, but possibly the death of the trees.

The first concerns a trial conducted by Mr. J. D. Bryden, when orchardist at Riverina Welfare Farm. Irrigation was withheld from five Washington Navel trees, then twenty-one years old and in a reasonably sound state, for the period 14th December, 1929, to 17th March, 1930—a total of ninety-three days. During that time no effective rain occurred, although a total registration of 159 points was recorded. Extremely hot weather conditions prevailed from 1st to 21st February, the mean maximum temperature being 93·9 degrees, with mean minimum recording 69·4 degrees Fahr.

No marked indications of a deficiency of soil moisture occurred until 21st January, when fruit measurements of developing fruit indicated a reduction in size as compared with fruit on trees irrigated more frequently. By 2nd February—fifty-two days after the last irrigation—the trees had developed a permanently wilted condition. All the leaves were curled and some defoliation was commencing. The condition of the trees gradually advanced to an acute stage when, owing to excessive curling and defoliation, the trees presented a rather thin appearance. This continued until 13th March, when twenty points of rain fell, resulting in a slight improvement in tree appearance. The fruit, too, firmed up slightly from a very wilted, flabby condition in which it had been since late in January. On 17th March the trees were irrigated and assumed a normal refreshed appearance a few hours later.

The fruit harvested from the non-irrigated trees matured smaller in size (and weight) than on more frequently irrigated trees nearby. When picked on 25th July, 1930, yields averaged 120 lb. per tree as compared with 193 lb. produced on regularly irrigated trees.

An undesirable feature associated with this trial was that the trees produced a heavy out of season blossoming in May, which affected the subsequent crop.

The second case of interest in this connection was conducted by Mr. C. Mort at Leeton Experiment Farm. Irrigation was withheld from ten years old Valencia late trees from 30th October, 1940, to 14th January, 1941—a total of seventy-five days. Rainfall during the period was insignificant, totalling only fifty-five points in six amounts. The evaporation recorded during this very dry part of late summer amounted to 18·908 inches.

Signs of an approaching dry soil condition became apparent by wilting tree condition early in December and this became gradually more severe. By the time irrigation was applied in mid-January, an advanced tree wilted condition was apparent, approximately 50 per cent. of the leaves having fallen. Trees in the adjoining row which had received water on one side only showed little appreciable wilt.

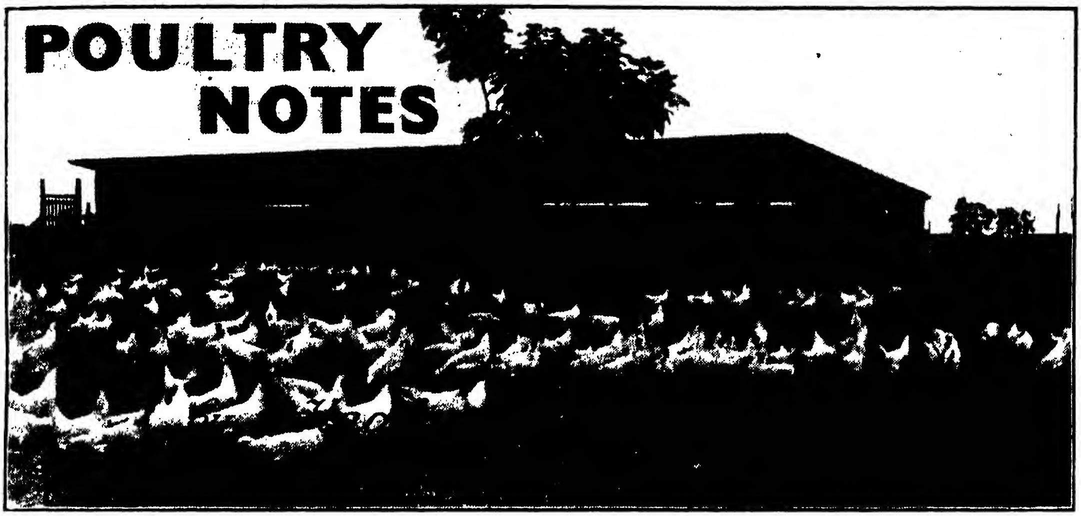
The effect on the mature fruit of withholding water from the trees was a noticeable reduction in size, though flavour was well retained. The young setting crop was somewhat reduced, however, for the crop harvested in December, 1942, was about 30 per cent. lighter than on trees nearby.

Apart from the latter result, no detrimental effects have been noted as a result of the protracted tree wilted condition imposed, and a normal crop of fruit is being carried this season.

The results of these two trials, supported by the experiences of growers in droughty seasons on non-irrigated areas, indicate the extreme resistance of citrus trees to appreciable injury from deficiency of soil moisture, even when subjected to lengthy periods of permanent wilt conditions.—R. J. BENTON, Special Fruit Instructor.

Help Win the War.

Keep On Buying War Savings Certificates.



Factors Affecting the Quality of Eggs.

THE hot and humid conditions usually experienced towards the end of the summer affect the keeping quality of eggs, and unless care is taken in their handling from the time they are laid until they reach the consumer, deterioration is likely to occur, resulting in lower returns to the producer. In order to obtain the maximum returns, therefore, all producers must ensure that everything possible is done to keep up the standard of quality.

There are many factors in the handling of eggs which have a bearing upon quality, and advice in this connection should assist producers who experience unsatisfactory returns.

Collecting and Washing.

The first essential in the handling of eggs is to collect them regularly, every day, or preferably twice per day, and then place them in the coolest room available to cool down before cleaning or packing. Eggs found in stray nests should not be included with the others.

It is important that eggs should neither be washed for at least five or six hours after being laid, nor in water which has a much lower temperature than the eggs, as this is a frequent cause of rots developing if bacteria responsible for rotting are present. When hand washing has to be done, it should be carried out under strictly hygienic conditions, with frequent changes of the water, and the eggs should be dried with a towel as quickly as possible and not allowed to stand in the sun or open air to dry. On no account should eggs be soaked in water or washed with dirty cloths. When cleaning by machine, every care must be taken to keep the machine in a sanitary state, by cleaning it daily and disinfecting with a non-tainting disinfectant such as sodium hypochlorite preparations in about 2 per cent. solution, or, failing such disinfectants, household soap or soap powder should be used liberally with vigorous scrubbing.

Eggs which are lightly stained can usually be cleaned by rubbing with ordinary washing soda in powder form on a wet rag and then washing. It should be realised that the inclusion in the pack of eggs which are slightly soiled or stained results in their being graded as "reject hen" or "2nd quality," and these are paid for at lower rates.

Keeping Eggs Clean.

Keeping the eggs as clean as possible and thus obviating the necessity for washing a large proportion of them will assist in the reduction of quality troubles; it should be realised that when eggs are washed, particularly if they are not dried at once, there

is a greater risk of infection by bacteria, thus causing a deterioration in quality.

While it is difficult to keep eggs clean in wet weather, much can be done under dry weather conditions to minimise the number of dirty eggs. One of the first requirements in keeping eggs clean is to provide adequate nests and keep the nesting material clean. Nests divided into compartments of approximately 13 inches long by 9½ inches wide and 6 to 7 inches deep, are preferable to long nests without divisions, as there is a tendency for the birds to crowd at one end of the long nests. It is necessary to provide one compartment of the size mentioned for each five hens. The nests should be placed in a darkened position rather than be exposed to the light, as the birds prefer some seclusion.

Egg Collecting Tin.
Note the wooden division to prevent crushing of eggs and the two handles joined at the top to give balance to the tin.

The most satisfactory material for the nests is shell grit, preferably with a layer of rice hulls on top, but the shell grit in the nests should not be depended upon for the requirements of the birds, as they will not eat it after it becomes soiled. If straw or rice hulls only are used, the birds quickly scratch these materials out, thus leaving the bottom of the nests bare and causing breakages.

The next requirement is to keep the houses reasonably clean, and much can be done in this direction by using some absorbent material such as rice hulls, straw, sand, or sawdust, etc., on the floors of the houses to assist in keeping the feet of the birds from becoming dirty. Concrete or wooden floors are essential to enable the houses to be kept clean.

Collecting the eggs at least twice daily will reduce the number of those becoming soiled, and covering the collecting bucket with a rainproof sheet in rainy weather will avoid much trouble.

If some of the fowls roost in the nests at night, it is an easy matter to arrange a closing device by having a hinged alighting board which can be closed after the last collection. Other measures for minimising the number of dirty eggs, are to avoid overcrowding of the houses, and, if semi-intensive houses are in use, to close in the birds during wet weather.

Prevent Breakages During Collection.

To prevent breakages during the collection of the eggs, care should be taken that the container in which they are collected has rigid sides. For instance, if a kerosene tin is used, it should have one side cut out and a wooden division fitted in the middle to prevent the sides from sagging inwards as the tin is filled. The tin should also have two handles, joined together to equalise the weight. A pad of straw or other material should be placed in the bottom of the collecting tin to save jarring and breaking eggs in the bottom.

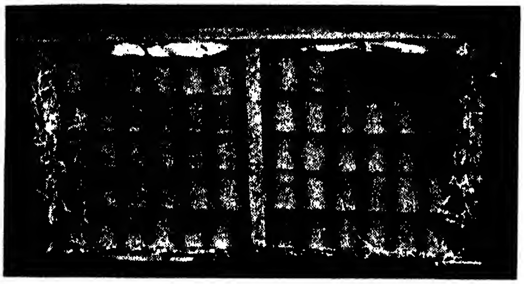
In the hot weather, particularly, it is advisable to remove any male birds from the pens, as fertile eggs will deteriorate more rapidly than those which are infertile, due to the development of the embryo. Leaving the eggs standing in the sun, even for a short length of time, should be avoided.

While it is realised that it might be difficult for many producers to carry out all the suggestions given, every effort should be made to improve conditions at the production end, so as to ensure the highest quality eggs being placed on the market.

When Packing the Eggs.

There are many small factors in the packing of eggs which have an important bearing upon quality, but one simple instance will perhaps serve to illustrate the necessity for paying attention to details. In packing eggs many producers do not take the trouble to see that all are put in the fillers with the

large end upwards. While failure to do this might have no serious effect when eggs are fresh and transported over short distances on good roads, the reverse is the case, particularly during the hot weather, when they have to be sent long distances by rail or road, especially if they are not quite fresh and the trip is rough. Under these conditions, if the eggs are packed with the large end downwards, the air cells of many become ruptured, causing air bubbles or what are known as tremulous air cells, and this results in the eggs being classified below first grade. Experiments carried out by the Department some years ago showed that among eggs sent from Grafton to Sydney, after having been kept for a week and packed large end downwards, the number affected with tremulous and large air cells reached as high as 68 per cent. compared with only 11 per cent. in those with the large end upwards. Similar results have been experienced overseas.



Case with Side Removed to Show Correct Method of Packing.

Note woodwool pads on the bottom and woodwoo packing at the ends of fillers to prevent undue movement; also crumpled paper pad on top.

Not only does packing the large end downwards cause these troubles but there is a greater risk of breakage occurring on account of the limited resistance of the large end compared with the small. Thus any pressure on large eggs is likely to result in a greater proportion of cracked or broken eggs.

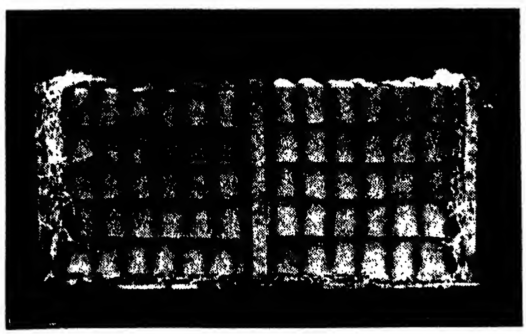
The Use of Buffers.

A number of other simple precautions should be taken in packing, especially when the eggs have to travel long distances or over rough roads. First comes the placing of a buffer on the bottom of the case before putting in the first filler. In all egg cases sent out by the Egg Marketing Board there are wood-wool pads for this purpose, but in the event of such pads having gone astray, the next best course is to use a pad of straw or dry grass, or crumple up a double sheet of newspaper for each half of the case and place it evenly over the bottom, before putting in the cardboard flat, followed by the first filler.

In most instances there is a space between the fillers and the sides or ends of the cases, and this allows too much movement of the fillers when transported over rough roads, often causing breakages. To avoid this, a crumpled piece of newspaper or a little wood-wool should be packed between each filler and the walls of the cases. As the case is being filled a flat is placed on each filler and, of course, on the top fillers, but here again another buffer is required; as wood-wool pads are not supplied for this purpose, a crumpled pad of newspaper will suffice to prevent the top flats from slipping out and will hold the fillers more rigid. However, undue pressure should not be caused on top of the eggs.

Filling the Cases.

In placing the eggs in the fillers there are a few important points to be observed. The first is that the eggs, also the fillers and flats, should be thoroughly dry, as any moisture will result in staining of the eggs.



The Same Case, Showing Correct and Incorrect Ways of Placing Eggs in Fillers.

Left.—Correctly packed—the ends of the eggs do not show above the filler.

Right.—Incorrectly packed—the eggs project above the filler.

Care should be taken that no long eggs project above the level of the fillers, and that no eggs are unduly tight in the cells. Any large eggs can be placed in the corner cells or along the sides of the fillers where

they can be turned at a slight angle to prevent them protruding above. Abnormally large eggs should not be packed.

After completing the packing, the number of eggs in the case should be clearly marked on the label, together with the name and address of the sender. If the cases are not being despatched at once, it is essential that they be not exposed to the sun or wind.

Useful Packing Bench.

The raised portion in the centre, on which the collecting bucket is placed is a fixture.

Transport Arrangements.

If a carrier is collecting the cases he should be requested to keep them covered during transit, and not to expose them to heat and wind. Country producers who convey the eggs to rail or depot, should observe the same points, and when despatched by rail these matters might be brought under the notice of the railway officers.

If the eggs are to be transported over rough roads, it is advisable to have a straw padding on the floor of the vehicle, and if necessary, between the side and the cases. Such pads could be made by loosely filling sacks with straw or grass.

By giving attention to these details much can be done towards preventing breakages and quality troubles.

Varieties of Approved Seed Available.

IN order that farmers may be directed to what are regarded by the Department as the most satisfactory local sources of approved seed of recommended commercial varieties of farm crops and vegetables, the Department is willing to supply information concerning such sources of seed of the following varieties:—

Wheat—
Bencubbin, Koala, Eureka I.

Oats.—
Belar, Fulghum.

Cauliflowers—
Hawkesbury Solid White, Nugget, Shorts.

Onions—
Hunter River White.

Pumpkins—
Queensland Blue.

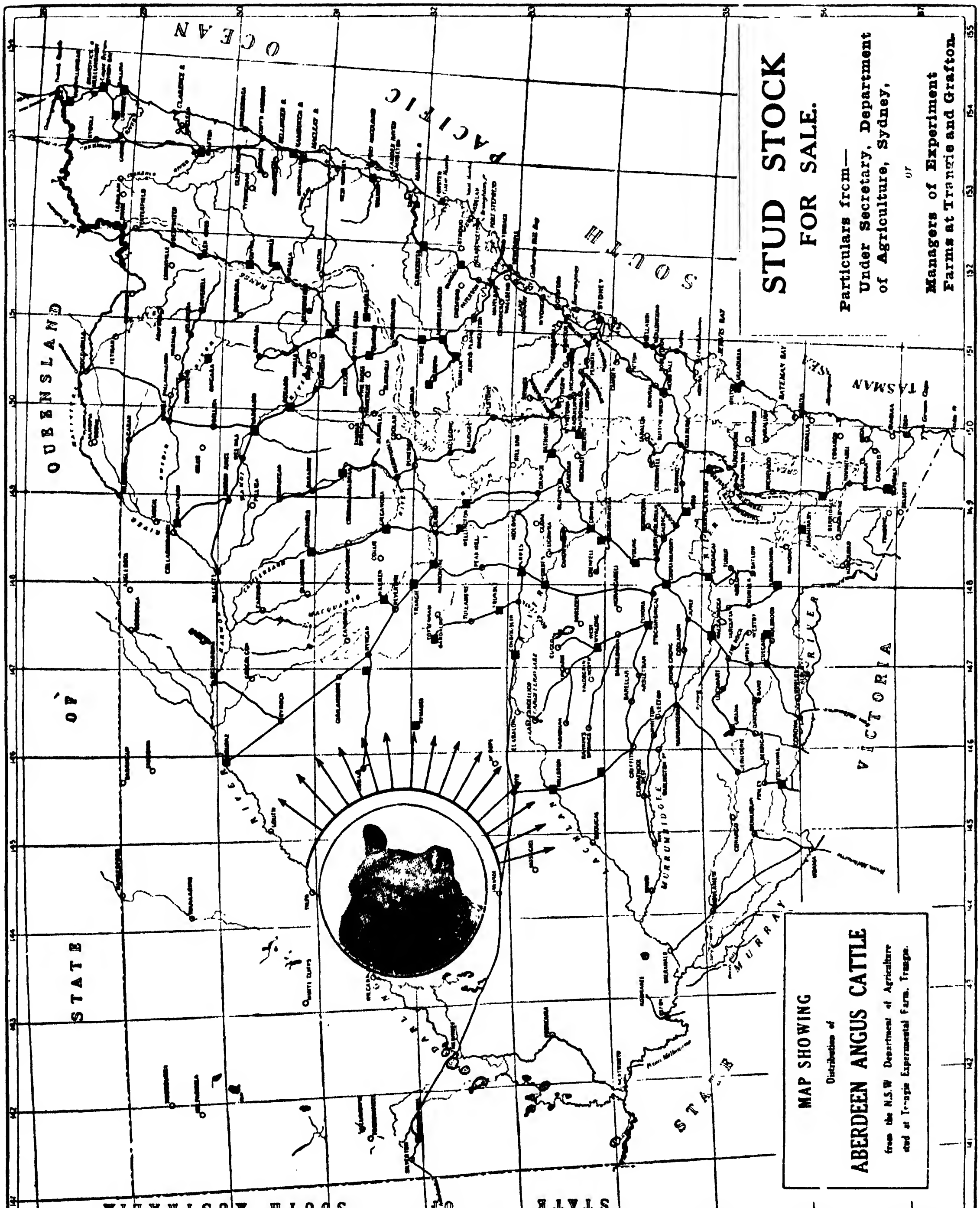
Grasses, etc.—
Phalaris tuberosa, Subterranean Clover (mid-season), Sheep's Burnet, Lucerne.

Hay Harvested by Volunteer Labour.

AN example of the type of work that District War Agricultural Committees have done in organising the labour resources of their districts to bring in the harvest comes from Tamworth.

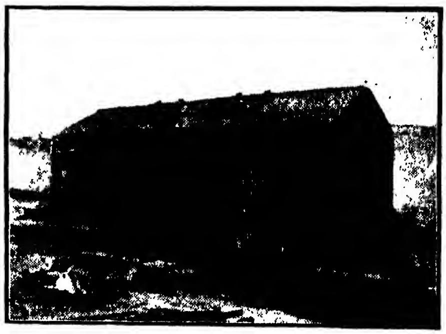
The secretary of that committee (Mr. E. H. Graham) reports that on one Sunday, 160 tons of hay was carted from the paddocks and stacked by a team of fifteen men from a Tamworth factory and fifteen R.A.A.F. men, who were taken by bus to Glen Moan, Willow Tree, about eighty miles from Tamworth. Three women from the factory and one W.A.A.F. accompanied the party and acted as cooks. At Glen Moan they were joined by seven lorry drivers, a tractor driver, the overseer and another man and a boy.

The men worked for thirteen and a half hours and were paid £2 5s. for the day. The owners estimated the cost of carting and stacking at approximately 18s. a ton and the work done was considered entirely satisfactory.


STUD STOCK
FOR SALE.
Particulars from—
Under Secretary, Department of Agriculture, Sydney,
or
Managers of Experiment Farms at Trangie and Grafton.
MAP SHOWING
Distribution of
ABERDEEN ANGUS CATTLE
from the N.S.W. Department of Agriculture stud at Trangie Experimental Farm, Trangie.
SOUTH PACIFIC OCEAN
TASMAN
QUEENSLAND
STATE OF VICTORIA
STATE OF SOUTH AUSTRALIA
MURRAY
SYDNEY

ROOFED TRUCKS for BULK WHEAT

DIFFICULTY in obtaining tarpaulins to cover the loads would have added greatly to the Department's problem in shifting bulk wheat this year had it not been for the foresight of the Commissioner in arranging for certain trucks then under construction to be provided with roofs. A large number of these have been put into service and, although the move was somewhat in the nature of an experiment, they have been an unqualified success.



As the illustration shows, the trucks have gable roofs and are fitted with four trapdoors through which bulk wheat is loaded, and there are eight hopper doors in the floor for its discharge. Classified as the RU type, each truck will carry about 21 tons of bulk wheat, that is, the equivalent of about 262 bags of wheat.

RU trucks represent still one more addition to the improved rolling stock brought into use during the term of the present Administration.

S. R. NICHOLAS,
Acting Secretary for Railways.

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
		1943.
F. and C. Ryall, 5 Western Avenue, West Wollongong	57	1 Feb.
McGarvie Smith Animal Health Farm, Liverpool	65	1 ,,
Wollongbar Experiment Farm	112	4 ,,
The Sydney Church of England Grammar School, Moss Vale	55	6 ,,
Tudor House School, Moss Vale	17	6 ,,
Koyong School, Moss Vale	2	6 ,,
New England Girls' Grammar School, Armidale	25	6 ,,
A. E. Stace, Taylor Street, Armidale	31	7 ,,
J. I. Toohey, "Mandemar," Berrima	56	8 ,,
W. J. Stephenson, "Hill View," Fig Tree	23	10 ,,
W. C. Wyatt, Sherwood Road, Merrylands	29	12 ,,
A. C. O'Dea, Perry Street, Dundas	28	19 ,,
C. Brownlaw, Gol Gol	34	26 ,,
Hurlstone Agricultural High School, Glenfield	33	26
W. W. Martin, "Narooma," Urana Road, Wagga	150	29 ,,
A. G. Wilson, Exeter (Jerseys)	68	29 ,,
New England University College, Armidale	13	1 Mar.
W. Boland, "Seaton," Inverell	9	1 ,,
Parker Bros., Hampton Court Dairy, Inverell	105	1 ,,
A. D. Frater, King's Plain Road, Inverell	106	1 ,,
Lunacy Department, Parramatta Mental Hospital	31	6 ,,
Trangie Experiment Farm, Trangie	138	19 ,,
Emu Plains Prison Farm	100	20 ,,
Lunacy Department, Morisset Mental Hospital	80	25 ,,
R. C. Dixon, Elwatan, Castle Hill (Jerseys)	23	3 April.
St. Michael's Orphanage, Baulkham Hills	18	5 ,,
Liverpool State Hospital and Home	102	10 ,,
F. C. Harcombe, Hillcrest Farm, Warialda Road, Inverell	32	15 ,,
Grafton Experiment Farm	190	17 ,,
K. W. D. Humphries, "Karoola," Muswellbrook	162	24 ,,
H. F. White, Bald Blair, Guyra (Aberdeen Angus)	137	26 ,,
Berry Training Farm, Berry	162	31 ,,
S. E. E. Cohen, Auburn Vale Road, Inverell	23	12 May.
B. N. Coote, Auburn Vale Road, Inverell	53	14 ,,
J. De Ville, Inverell	10	15 ,,
A. N. De Fraine, Reservoir Hill, Inverell	22	15 ,,
Sir F. H. Stewart, Dundas	6	30 ,,
Cowra Experiment Farm	41	27 June.
P. M. Burtenshaw, Killean, Inverell	31	27 ,,
A. E. Liggins, "St. Leger Dairy," Kuring-gai Chase Road, Turramurra North	52	7 July.
Kahlua Pastoral Co., "Kahlua," Coolac	314	10 ,,
Lunacy Department, Rydalmere Mental Hospital	65	30 July.
W. J. Frizelle, Rosenstein Dairy, Inverell	76	1 Aug.
W. Budden, "Hunter View," Kayuga Road Muswellbrook	18	7 ,,
T. McLane, Wellingrove, Inverell	33	10 ,,
W. Willis, "Rosedale," Inverell	17	13 ,,
E. L. Killen, "Pine Park," Mumbil	252	23 ,,
A. Hannaford, Braidwood	20	25 ,,
W. S .Grant, Braidwood	20	26 ,,
J. McKenzie, Inverell	35	28 ,,
Farrer Memorial Agricultural High School, Nemingha	39	29 ,,
The William Thompson Masonic School, Baulkham Hills	50	29 ,,
Navua Ltd., Grose Wold, via Richmond (Jerseys)	113	4 Sept.
Australian Missionary College, Cooranbong	113	8 ,
Department of Education, Gosford Farm Home	40	29 ,,
A. L. Logue, "Thornbro," Muswellbrook	46	13 Oct.
Woomargama Estate	207	22 ,,
Barnardo Farm School, Mowbray Park	75	4 Nov.
State Penitentiary, Long Bay	10	9 Dec.
		1944.
Limond Bros., Morisset	60	13 Jan.
Department of Education, Yanco Agricultural High School	69	6 Feb.
Riverina Welfare Farm, Yanco	74	6 ,,
C. Wilton, Bligh Street, Muswellbrook	75	3 Mar.
N. L. Forster, Abington, Armidale (Aberdeen Angus)	188	12 ,,
Forster and Sons, Abington, Armidale (Jerseys)	87	13 ,,
Wagga Experiment Farm (Jerseys)	81	20 ,,
St. Ignatius College, Riverview	25	27 ,,
Lunacy Department, Callan Park Mental Hospital	26	1 May.
T. J. Wilks, "Oaks Farm," Muswellbrook	37	5 June.
New England Experiment Farm, Glen Innes (Jerseys)	73	27 ,,
G. T. Reid, "Narrengullen," Yass	274	3 July.
Farm Home for Boys, Mittagong	49	9 ,,
St. Vincent's Boys' Home, Westmead	26	20 ,,
Lidcombe State Hospital and Home	106	30 ,,
Ehsman Bros., Inverell	28	13 Aug.
Peel River Land and Mineral Co., Tamworth (Beef Shorthorns)	82	28 ,,
Bathurst Experiment Farm	24	9 Oct.
Lunacy Department, Gladesville Mental Hospital	34	23 Nov.
Hawkesbury Agricultural College, Richmond (Jerseys)	110	18 Dec.

Tubercle-free Areas.

The following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis :—

Bombala Area.
Inverell Area.
Braidwood Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

MAX HENRY, Chief of Division of Animal Industry.

Brucellosis-free Herd Scheme (Swine).

LIST OF ACCREDITED HERDS.

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Adams, J. P., "Melton," Daysdale.
Bathurst Experiment Farm, Bathurst.
Boardman, C., Camden.
Campbell, D., Hillangrove, "Wamberal," via Gosford.
Chapman, G. E. and Son, "Illabo Park," Alectown.
Cocks, F. D., "Condalarra," Gooloogong.
Cowra Experiment Farm, Cowra.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., "Glengar," Capertee.
Farrer Memorial Agricultural High School, Nemingha.
Foley, Mrs. E., Bligh Stud Piggery, Water Lane, Rouse Hill.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Holland, A. L., Argonne, Tubbul.
Hurlstone Agricultural High School, Glenfield.
Maybin, N. C., Towac, Orange.
McCaughey Memorial Agricultural High School, Yanco.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Government Agricultural Training Farm, Scheyville.
Shirley, G. F., "Camelot," Penrith.
Smith, J. M., Eulo Glen, Urana.
Stewart, Sir Frederick, "St. Cloud," Dundas.
Wagga Experiment Farm, Bomen.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., "Gwandalan," Grenfell.
Wilson, A. G., Blytheswood, Exeter.
Wollongbar Experiment Farm, Wollongbar.

Herds Other than Registered Stud Herds.

Bathurst Gaol, Bathurst.
Berry Training Farm, Berry.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Croft, H. M., "Salisbury Court," Uralla.
Glen Innes Prison Camp, Glen Innes.
Gosford Farm Home for Boys, Gosford.
Goulburn Reformatory, Goulburn.
Kenmore Mental Hospital, Kenmore, via Goulburn.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital, Orange.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital, Parramatta.
Peat and Milson Islands Mental Hospital, Hawkesbury River
Pollak, V., Marata, Harrow Road, Glenfield.
Smith, C. W. J., "Norbiton," Canadian Lead.
Stockton Mental Hospital, Stockton.
Waterfall Sanatorium, Waterfall.

Abortion-free Herds.

THE following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion-free :—

Owner and Address	Number in herd.
Bathurst Experiment Farm (Ayrshires)	24
Bauerle, P. A., Holbrook	9
Bush, W., Ben Lomond	18
Callan Park Mental Hospital (Aberdeen Angus)	41
Carrick, G., "Clonlea," Central Tilba	37
Cowra Experiment Farm (Ayrshires)	71
Department of Education—Farm Home for Boys, Gosford	36
Dixson, R .C., "Elwatan," Castle Hill	24
Edwards, G. M., "Rothwick," Uralla (Jerseys)	4
Fairbridge Farm School, Molong	93
Farrer Memorial Agricultural High School, Nemingha	35
Forster and Sons, Abington, Armidale (Jerseys)	265
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	188
Gladesville Mental Hospital	34
Grafton Experiment Farm (Aberdeen-Angus)	29
Grafton Experiment Farm (Australian Illawarra Shorthorns)	93
Hawkesbury Agricultural College, Richmond (Jerseys)	108
Hicks A. A., Estate, Culcairn	52
Hill, E. Pritchard, Bowling Alley Pt. (Jerseys)	96
Hordern, E. D., Cabramatta (A.I.S.)	95
Hurlstone Agricultural High School, Glenfield	39
Killen, E. L., "Pine Park," Mumbil	223
Leitch, J. F., "Tunbridge," Merriwa (Aberdeen-Angus)	48
McEachern, H., Tarcutta (Red Poll)	9
Martin Bros., "Narooma," Urana-road, Wagga	125
Morisset Mental Hospital	80
Navua Ltd., Grose Wold, via Richmond (Jerseys)	122
New England Experiment Farm, Glen Innes (Jerseys)	97
New England University College, Armidale	16
Peel River Land and Mineral Co., Tamworth	82
Reid, G. T., "Narrangullen," Yass	171
Robertson, D. H., Scone	82
Rydalmere Mental Hospital, Rydalmere	57
Salway, A. E., Cobargo	95
Skinner, D. S., "Wyworrie," Ben Lomond	98
Smith, Jas. C., Ben Lomond	83
Stewart, Sir Frederick, "St. Cloud Stud," Spurway-street, Dundas	9
Trangie Experiment Farm, Trangie	88
Wagga Experiment Farm, Bomen, N.S.W.	81
Walker, Jas. R., "Strathdoon," Wolseley Park	32
White, F. J., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	137
Williams, Chas., Ben Lomond	27
Young, A. H., "Rock Lynn," Cudal (Polled Beef Shorthorns)	7

MAX HENRY, Chief of Division of Animal Industry.

The Agricultural Gazette.

March, 1943.

A BIGGER JOB AHEAD.

AS the nation strains more and more to achieve victory, so will the problems and difficulties of every section of the community increase. Primary producers have been through trying times during the past season, and discouraging as it may seem to suggest an intensification of their troubles this season, it would be foolhardy not to take into account such a probability.

Farm labour is at the root of all rural problems, and rural workers will certainly be in no greater supply than last season. Relatively, if not actually, they will be scarcer this season than last, if for no other reason than that Australia, in common with other countries, must produce more food to ensure victory.

In addition, the continued enforced neglect during past seasons, of replacements and repairs of farm machinery and other assets, must sooner or later tend to make it increasingly difficult to keep up our wartime food requirements. Furthermore, an intensified programme of munitions manufacture will also tend to make for greater shortages of farm requirements. And even if our fighting forces are not enlarged there will still be a further continuous drain on our remaining manpower to fill the gaps in the ranks caused by the ravages of war and sickness.

On top of all these problems, farmers will be asked—if not prevailed upon—to shape their production programme more strictly in accordance with the nation's and our allies' wartime food production programme. Food is a vital war weapon, but, like munitions, it must be of the right kind. In other words, to play his part loyally and effectively on the food front, each farmer must produce, in kind as well as quantity, only those items which the nation has specified as essential. The present is no time to weigh the relative profitableness of various crops and to be guided entirely by such considerations. The profit motive can be a most misleading guide in an all-in war effort.

There will assuredly be shortages in almost every direction. Our army is not as big as desirable: nor is our air force or navy. We have not all the munition workers we would like. The supply of consumer goods (even essentials) is far below demand. If all the problems which arise are viewed from a national standpoint and not sectionally it will be realised that the causal shortages—manpower, machines, materials, etc.—are unavoidable, particularly when a nation of seven million inhabitants wages

war against a foe immensely superior in numbers. So far as primary producers are concerned, however, the full impact of war-created difficulties can be avoided by a greater intensification of co-operative effort. In other words, the solution of their problems lies largely, if not entirely, in their own hands.

An Urgent Appeal for Labour for Rural Industries.

AN appeal is made to farmers, rural employees and registered seasonal workers, to secure casual employment in essential rural industry, and also in associated industries.

Men are also required urgently for employment at undertakings producing superphosphate—on the work of bagging, handling, lumping and trucking. Such men will require to be of a sufficient physical standard to perform this work.

Large numbers of men are required for the fruit harvest, and there is also a constant call for labour to harvest the potato crops in Tableland areas. In addition there is a demand for labour for associated industries, such as fruit processing, handling wool and the manufacture of spray material for crops.

This appeal is made to farmers and employees on farms who can, as a natio effort, leave their present work for short periods of, say, four weeks, to assist in this work. Any persons interested are requested to contact their local War Agricultural Committee or the National Service Officer for the district.

Acceptance of employment as above would not prejudice any claim for reservation from military service.

Group Discussions of Post-war Reconstruction Problems.

POST-WAR reconstruction should be the concern not only of experts and politicians but of every member of the community. In the main, it is just ordinary people who are fighting to preserve the principles of democracy, and they should be prepared to make those principles work when the "cease-fire" sounds.

Radio listeners should therefore avail themselves of the facilities offered by the Australian Broadcasting Commission to help them sort out the issues and clarify their minds on the subject. The A.B.C. has arranged the following series of talks on some of the problems of post-war reconstruction in Australia. On the Thursday of each week a speaker who has made a special study of a particular problem will present his views on it on the National Programme (2FC, 3AR, 4QG, 5AN, etc.). On the following Monday, a group of three or more speakers, who will represent the views of the man-in-the-street, will discuss the same subject on the alternative programme (2BL, 3LO, 4QR, 5CL, etc.).

Listeners are invited to listen to these talks in the company of others, forming for the purpose "listening groups" of from six to a dozen people who meet in one another's homes. Discussion then takes place on the broadcasts and the leader of each group is invited to send to the Organiser of Listening Groups of the Australian Broadcasting Commission in Sydney, comment, criticism or questions for further information, arising out of the group's discussion. These will be passed on to the speakers for consideration and reply.

A good idea is for members of listening groups to listen-in to the first (or Thursday night) talk, individually, and meet for the discussion of the second (or Monday night) broadcast on each subject. All talks, however, will provide good material for discussion. Copies of the scripts and other literature will be made available to each listening group free of charge by the Organiser of Listening Groups, Box 487 AA, G.P.O., Sydney.

The programme of talks for March and April is as follows:—

Thursdays—8 to 8.15 p.m.

March 4—"Freedom and Control," by Dr. E. R. Walker.

March 11—"Production for the People," by Dr. E. R. Walker.

March 18—"Parliamentary Government," by T. H. Kewley.

March 25—"Training for New Leisure," by Colin R. Badger.

April 1—"A New Deal for Youth," by Gordon Young.

April 8.—"It All Depends on Me," by Professor John Elliott.

Mondays—8 to 8.20 p.m.

Discussion of the above talks by groups of laymen and women.

Keep on Buying War Savings Certificates.

Well-made Paspalum *(Paspalum dilatatum)* Hay
Is Good Feed for Stock.

J. N. WHITTET, H.D.A., Chief Agrostologist.

WHILE some people in New South Wales look upon paspalum (*Paspalum dilatatum*) as a plant that is not very suitable for converting into hay, this view is not held by the author, who, in writing on the management of paspalum pastures, has always stressed the fact that many thousands of tons of ready-made "crop" go to waste in coastal districts in average to good seasons because this surplus feed is not harvested. His contention is supported by a number of coastal farmers who regularly cut some paddocks for grass hay. Even during the past few months, with shortage of labour more acute than it has ever been, a large number of farmers in the areas around Berry and Nowra have built stacks of grass hay consisting principally of paspalum.

When cut at the correct stage of growth, and particularly if a proportion of clover growth is present, the feeding value of conserved paspalum hay is high. The correct period of growth to cut for hay is just as the seed heads appear. Ergot may then be developing on some of the earlier-formed heads, but it is only in the honey-dew stage, and this will not cause any digestive troubles in stock. If, however, the ergot has reached the "ball" stage, through the grass becoming more mature before being harvested, this type of hay may prove injurious if fed in that form, or as chaff, particularly if ergot is plentiful.

Cut early and evade trouble is a sound recommendation to the paspalum hay maker.

Cutting Improves the Sward.

The removal of surplus grass growth leaves the paddocks in better condition to produce the type of pasturage required by cows in high production, *viz.*, succulent young grass containing clover growth; clovers cannot thrive in a dense development of over-mature paspalum.

The profitable results obtained from converting surplus paspalum growth into either hay or silage, and the beneficial effects of such removal on subsequent pasture growth, have been demonstrated by this Department in many coastal dairying districts, but in no case more advantageously than at the Training Farm for Boys, Berry. During the 1929-31 period, this farm was controlled by the Department of Agriculture and investigations dealing with grassland management problems were conducted; these included grass hay and grass silage production methods.

Carting a Heavy Crop of Paspalum Hay at the Training Farm for Boys, Berry.

Some 1943 Hay-making Experiences.

Mr. P. Waller, Manager of the Berry Training Farm estimated that paddocks cut in the early flowering stage at the end of January yielded 2 tons of paspalum-White clover hay per acre; a fortnight after stacking this material the milking cows were grazing on fresh, young pasture growth in

The Rake at Work in a Heavy Crop of Paspalum Hay.
Training Farm for Boys, Berry.

these areas. A similar yield was obtained from a *Phalaris tuberosa* paddock; this included a proportion of Red and White clover and made excellent quality hay. These areas have been renovated, grass harrowed and topdressed with lime and superphosphate during past years.

Mr. A. W. S. Ison, Jasper's Brush, was making grass hay from a 2-acre Departmental demonstration area of *Phalaris tuberosa,* White, Barrel, Subterranean and Red clovers during a recent inspection by the author. This block yielded 6 tons of good quality, ergot-free hay per acre. The seeds mixture on 1 acre consisted of *Phalaris tuberosa* 3 lb., Subterranean clover 4 lb. (early 2 lb., late strain 2 lb.), White clover 2 lb.; the remaining acre had a similar amount of *Phalaris* plus Subterranean clover (mid-season strain) 2 lb., Barrel clover 2 lb. and New Zealand Montgomery Red clover. Planting was carried out in June, 1942, when 2 cwt. superphosphate per acre was used.

A number of hourly grazing periods were obtained by the dairy herd on this succulent feed during the June-November period, in addition to ten heifers being constantly in the paddock for a month until mid-November. This performance represents a particularly good effort for a young pasture on second-class hill country.

Early in January this farmer cut paspalum-White clover paddocks which averaged 3 tons of hay per acre. This cured into an excellent quality hay; it was cut in the early flowering stage.

Mr. Ison regularly renovates, topdresses with lime and superphosphate, and grass harrows his natural and improved pasture lands. On his highest producing areas ½ ton ground carbonate of lime is applied every two years and 1½ to 2 cwt. superphosphate annually.

Stacking *Phalaris tuberosa* Hay on Mr. A. W. S. Ison's Property at Jasper's Brush.

This farmer expressed his opinion of the value of good quality paspalum hay, when he said: "I would buy it any day in preference to oaten hay." Three years ago Mr. Ison stacked 100 tons of paspalum hay and is chaffing the last of it now.

Mr. C. T. Hindmarsh, Alne Bank, Gerringong, also made good hay this season from a *Phalaris tuberosa*, Red, Subterranean and White clover area. He finds that by cutting *Phalaris* for hay during the summer period, the grass will then respond better to any falls of rain, and develop better leaf growth than where the dry seed stems are allowed to persist on the plants.

The carrying capacity, butter-fat production and fertiliser treatments for variously managed areas at Berry, together with chemical analyses of the feed produced, are fully reported in the June, 1931, issue of the *Agricultural Gazette;* reprints of this article can be obtained on application to the Under Secretary, Department of Agriculture, Box 36A, G.P.O., Sydney. The value of this early work is reflected in the pasture improvement and management practices now adopted in the Berry district. Mr. Curtis Moy, seed merchant of Berry, recently informed me that 80 per cent. of the dairy farmers in that district now conserve pasture hay, the bulk of it being paspalum.

Protection of Seed Potatoes from Moth Damage.

WHERE potatoes for use as seed, are to be held on the farm for any length of time, protective treatment against potato moth is frequently necessary, particularly in the warm coastal districts.

Dusting with either derris or pyridine dusts has so far proved to be the most effective treatment. Derris dust is best used in the proportions of 1 part to 4 parts by weight, but is hard to obtain at present, and a dust consisting of 1 part pyridine (obtainable from the Nightingale Supply Co., Waterloo) and 19 parts kaolin by weight is far cheaper and is effective.

The tubers must be given a thorough and even coating of dust; 1 lb. dust per bag is sufficient to give a thorough cover.

Method of Application.—If the grower possesses a large drum or barrel which can be rotated, this will be most suitable for mixing the dust and tubers. Place potatoes and dust in the drum and rotate for about a minute; then bag. The quantity of tubers to be treated each time depends on the size of the barrel. Individual judgment is necessary to determine what quantity can most effectively be treated at a time.

If no special equipment is available the following method can be recommended:—

Select a corner of the shed or barn, if possible with a smooth floor surface, such as concrete. Failing this, a sheet of flat galvanised iron about 6 feet square is quite suitable. A board 4 to 6 inches wide and about 6 feet long is placed along one side about 6 feet from the corner. Thus, an area of floor 6 feet square, enclosed on three sides, is formed. A bag of potatoes is then emptied on to this area and spread out in a single layer, and the required amount of dust is sprinkled over the tubers, using a tin with a perforated lid.

Using a wide-mouth shovel one-third of the potatoes are then placed in a bag. One end of the bag is taken by each operator and the potatoes given a thorough shaking up for several seconds. Another third of the potatoes is then similarly shaken up in a second bag and tipped into the first bag, and the remaining third treated.

By this method two men can comfortably treat ten bags per hour. The dusted tubers should be stored in bags until it is time to "green" them.

These dusts are not intended for tubers which are already showing appreciable damage by well-established grubs. They do, however, give protection against young grubs which have not entered the tubers. A large percentage of tubers may be apparently free from infestation when bagged, but actually are infested with eggs which are not visible to the naked eye. When these eggs hatch, the grubs freely infest the tubers. It is against such infestation that dusting is a sure protection.

Table potatoes must not be dusted with pyridine, which has a powerful odour and taints the tubers.—N. C. LLOYD, Assistant Entomologist.

No Examination of Stallions During 1943.

IT has been decided to suspend, for 1943, the operation of the provisions of the Horse-breeding Act which require the registration of stallions.

Shortage of staff, petrol restrictions and other difficulties created by the war have made it impossible to carry out examination of stallions during 1943. It is still necessary, however, points out the Chief of the Division of Animal Industry, for persons who have not yet notified the Department of Agriculture of the possession of a stallion to do so. The Department must also be notified as to transfers, deaths and castrations of stallions.

The Enemy Listens . . . . Guard Your Tongue.

Approved Seed.

March, 1943.

To assist in the production and distribution of approved seed of recommended varieties of crops and vegetables, the Department publishes in this list each month the names and addresses of growers of such seed. For this service a charge of 2s. 6d. is made for each insertion of each variety listed. The number of varieties listed on behalf of each grower will be restricted to twenty-five for the time being. The Department may inspect the crop producing the seed, and in all cases a sample of the seed must be sent to the Department of Agriculture with information as to the location of its production, and must be accompanied by the fee indicated above.

If any seed producer does not wish to pay the advertising charge he may submit his name with the variety of seed and sample to the Department, and if it is approved his name will be listed in the Department and information will be supplied regarding it to inquirers.

Wheat—

Bencubbin.—Manager, Experiment Farm, Wagga. (5s. 6d. bushel, f.o.r.)
Bencubbin.—Manager, Experiment Farm, Temora. (5s. 6d. bushel, f.o.r.)
Bencubbin.—Manager, Experiment Farm, Cowra. (5s. 6d. bushel, f.o.r.)
Bencubbin.—Manager, Experiment Farm, Trangie. (5s. 6d. bushel, f.o.r.)
Bordan.—Manager, Experiment Farm, Wagga. (5s. 6d. bushel, f.o.r.)
Bordan.—Manager, Experiment Farm, Cowra. (5s. 6d. bushel, f.o.r.)
Dundee.—Manager, Experiment Farm, Wagga. (5s. 6d. bushel, f.o.r.)
Dundee—Manager, Experiment Farm, Cowra. (5s. 6d. bushel, f.o.r.)
Eureka.—Manager, Experiment Farm, Temora. (5s. 6d. bushel, f.o.r.)
Eureka.—Manager, Experiment Farm, Cowra. (5s. 6d. bushel, f.o.r.)
Eureka.—Manager, Experiment Farm, Trangie. (5s. 6d. bushel, f.o.r.)
Eureka 2.—Manager, Experiment Farm, Trangie. (5s. 6d. bushel, f.o.r.)
Ford.—Manager, Experiment Farm, Wagga. (5s. 6d. bushel, f.o.r.)
Ford.—Manager, Experiment Farm, Cowra. (5s. 6d. bushel, f.o.r.)
Ghurka.—Manager, Experiment Farm, Wagga. (5s. 6d. bushel, f.o.r.)
Gular.—Manager, Experiment Farm, Temora. (5s. 6d. bushel, f.o.r.)
Koala.—Manager, Experiment Farm, Temora. (5s. 6d. bushel, f.o.r.)
Pusa 111.—Manager, Experiment Farm, Temora. (5s. 6d. bushel, f.o.r.)
Ranee.—Manager, Experiment Farm, Wagga. (5s. 6d. bushel, f.o.r.)
Totadgin.—Manager, Experiment Farm, Trangie. (5s. 6d. bushel, f.o.r.)
Waratah.—Manager, Experiment Farm, Wagga. (5s. 6d. bushel, f.o.r.)

Wheat—(continued.)

Waratah.—Manager, Experiment Farm, Cowra. (5s. 6d. bushel, f.o.r.)
Waratah.—Manager, Experiment Farm, Trangie. (5s. 6d. bushel, f.o.r.)
Bungulla.—Manager, Experiment Farm, Temora. (5s. 6d. bushel, f.o.r.)
Bungulla.—Manager, Experiment Farm, Trangie. (5s. 6d. bushel, f.o.r.)
Gluford.—Manager, Experiment Farm, Cowra. (5s. 6d. bushel, f.o.r.)

Oats—

Belar.—Manager, Experiment Farm, Temora. (4s. 6d. bushel, f.o.r.)
Belar.—Manager, Experiment Farm, Cowra. (4s. 6d. bushel, f.o.r.)
Belar—Manager, Experiment Farm, Trangie. (4s. 6d. bushel, f.o.r.)
Buddah.—Manager, Experiment Farm, Trangie. (4s. 6d. bushel, f.o.r.)
Fulghum.—Manager, Experiment Farm, Temora. (4s. 6d. bushel, f.o.r.)
Gidgee.—Manager, Experiment Farm, Temora. (4s. 6d. bushel, f.o.r.)
Gidgee.—Manager, Experiment Farm, Trangie. (4s. 6d. bushel, f.o.r.)
Guyra.—Manager, Experiment Farm, Bathurst. (4s. 6d. bushel, f.o.r.)
Kareela.—Manager, Experiment Farm, Trangie. (4s. 6d. bushel, f.o.r.)
Mulga.—Manager, Experiment Farm, Temora. (4s. 6d. bushel, f.o.r.)
Mulga.—Manager, Experiment Farm, Trangie. (4s. 6d. bushel, f.o.r.)
Weston.—Manager, Experiment Farm, Cowra. (4s. 6d. bushel, f.o.r.)
Wongan.—Manager, Experiment Farm, Temora. (4s. 6d. bushel, f.o.r.)

Barley—

Pryor—Manager, Experiment Farm, Wagga. (5s. bushel, f.o.r.)
Trabut.—Manager, Experiment Farm, Wagga. (5s. bushel, f.o.r.)

Cauliflowers.

Hawkesbury Solid White—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Tomatoes.

Marvana — Rumseys Seeds Pty. Ltd., 331 Church-street, Parramatta.
Australian Earliana—Rumseys Seeds Pty. Ltd., 331 Church-street, Parramatta.
Red Marhio No. 95—Rumseys Seeds Pty. Ltd., 331 Church-street, Parramatta.

Onions.

Extra Early Flat White—Mr. Sam Anthony, High-street, Hillston.
Odourless—Mr. Sam Anthony, High-street, Hillston.

Primary Producers' Associations Consider Control of Production.

THE New South Wales Council of Primary Producers' Associations, on which the Agricultural Bureau, Farmers and Settlers' Association, Wheat Growers' Union, Sheepbreeders' Association, Graziers' Association, Potato Growers' Association, Stud Pig Breeders' Association and the Rice Growers' Association are represented, was recently asked by the Minister for Agriculture to act as a consultative body, in addition to functioning in a purely advisory capacity. The Minister wrote to the Association: "I will arrange from time to time for the Council to be consulted on various problems arising with primary industries, and would now suggest that the Council should furnish me with its views on the control of production and the contract system of production generally."

At a recent meeting the members of the Council discussed the following points submitted by the chairman (Mr. J. Cavanagh, Agricultural Bureau) relative to the control of production.

(*a*) War time control of production is necessary in order to ensure best use of manpower, implements, transport, storage and many other limited resources, such as equipment, replacements, fertilisers, wire and fencing materials in general, liquid fuel, rubber, etc.

(*b*) Such war-time control should be based on a national policy of ensuring—

1. Adequate supplies of wanted as against unwanted produce.
2. Adequate attention to conservation of productive capacity in such agricultural industries as may not be essential at the particular time, but may be essential later.

(*c*) The quickest means of assuring adequate production of wanted produce is through a policy of subsidising—

1. "Basic" primary produce, such as fodder; and/or
2. "Refined" primary produce, such as meats, dairy products and vegetables.

Subsidies may be applied either as—

1. A means of support to an essential but otherwise unpayable industry, or
2. A means by which to divert production efforts from less essential to more essential commodities.

(*d*) The contract system has something in its favour as a means for ensuring continuity of adequate supplies of wanted commodities. It implies a guaranteed payable return to the producer, even though seasonal conditions may cause a glut such as has recently occurred in potatoes. The risk is borne by the nation as a whole, through its Government, and rightly so since the nation needs the food and might cease to get it in adequate quantities if the producer has to carry the full effect of such gluts.

(*e*) The mention of "guaranteed payable return to the producer" raises the question of price fixation.

(*f*) Whether concerned with contract production or not, price fixation must retain sufficient elasticity to account for increases in the producers' cost of living and costs of commodities essential to production. In brief, there is need for price fixing formulae whereby the nation can guarantee parity prices to the producer of essential commodities.

(*g*) Arbitrary fixation of maximum prices by the Prices Commissioner has undoubtedly interfered with essential expansion of certain food production.

(*h*) Where certain prices may need adjustment as a counter measure to inflation, the Commissioner should institute a graduated price, *i.e.*, reduce the price over a period by a notified graduated scale, in order that producers who have recently undertaken considerable expansion in that particular essential industry shall not be placed in a losing position.

(*i*) Development of a parity price system, in which the Government by special appropriations ensures the producer payable returns under any current conditions, would require the producer to accept planned acreage-allotments or herd- or flock-size allotments.

(*j*) Only producers who keep within the prescribed allotments could expect to benefit by the parity system.

(*k*) Peace time control of production should embrace (*i*) and (*j*) in conjunction with a Farm Conservation Programme. The latter would provide supplementary income, from the Government, to producers who perform an adequate part of the conservation programme and who simultaneously keep within the allotment of "parity crops or other produce" for the farm concerned.

Following this discussion the Council referred the matter back to the constituent bodies for consideration.

During the meeting the Council also carried the following resolution:—

"That this Council views with very great concern, for its effect on subsequent production in New South Wales, the incursion by the Prices Commissioner into the field of maximum open market price fixation of certain agricultural products—cases in point being certain vegetables and pig meats. The Council, therefore, urges that in future the Commissioner should act in such price fixation of any agricultural primary products in

(*Continued on page* 134.)

Vegetable Seed Shortages—Contract Growers Wanted Urgently.

THERE are still serious shortages of seed of carrots, red beet and cabbages, and it is essential that every effort be made to sow immediately sufficient areas of each of these vegetables for seed production, otherwise the present limited stock will be rapidly depleted, eventually causing decreased production of these crops.

Growers desirous of planting these crops for seed under contract are urged immediately to contact their local Agricultural Instructor or apply direct to the Division of Plant Industry, Department of Agriculture, Box 36A, G.P.O., Sydney, for further particulars. Too great emphasis cannot be placed on the importance of immediate sowing of carrots, red beet and cabbages for seed production. The Department of Agriculture, acting on behalf of the Vegetable Seeds Committee, will arrange to supply seed to growers who contract to grow these crops for seed.

The following prices will be paid to contract growers for the seed produced:—Carrot seed 8/6 lb., red beet seed (transplanted) 4/- lb., red beet seed (non-transplanted) 3/- lb., cabbage seed 10/- lb.

To cope with the increasing demands of the allied fighting services for vegetables, both raw and canned, an extensive vegetable-growing programme has been put into operation, and therefore it is essential that adequate seed supplies be made available to ensure the continual supply of these vegetables. Furthermore, the demand of the civilian population is by no means small, and considerable quantities of seed are also required for this purpose.

Some months ago the Vegetable Seeds Committee was given power by National Security Regulations to control the distribution and the sale of seed of carrots, red beet, silver beet, cabbage and swede turnips as the stocks of these were very low, whilst the position with regard to other vegetable seeds was considered satisfactory. The position with regard to silver beet and swede turnip seed may now be considered fairly satisfactory, but that of carrots, red beet and cabbage is still serious.

Australia has grown very little vegetable seed in the past and has been prepared to import practically all her requirements, but because of the present uncertain position in the Pacific we must now make an immediate supreme effort to become self supporting in this regard.

Guyra Agricultural Bureau Has Successful Year.

THE recently issued annual report of the Guyra Branch of the Agricultural Bureau records many excellent achievements.

It was this body which gave a lead in the matter of district planning to overcome wartime farming difficulties. Guyra Bureau, also, was one of the first to answer the Government's appeal to conserve vegetable seeds to tide over the Commonwealth-wide shortage last season. So generously did farmers in the Guyra district respond to the Bureau's appeal that it was found possible to donate over 1 cwt. of seed to the New South Wales Department of Agriculture.

Another activity attended with outstanding success was the co-operative handling of the canning bean crop. Over 1,200 acres are now under this crop in the Guyra area, much of which will be taken off this season by bean harvesting machines recently imported from U.S.A. In this regard, the Guyra organisation is working in close co-operation with the Department of Supply and Shipping and the New South Wales Department of Agriculture.

Co-operative effort has also been extended to the harvesting and marketing of other crops—potatoes, peas, oats—in this area.

If there is any area in New South Wales where producers might be justified in sitting back and contemplating the future with equanimity it is in the Guyra district. They have foreseen, planned and overcome many difficulties in the past, but with a good sense of realism they still foresee further problems ahead. For the Guyra Bureau the completion of one big job merely marks the commencement of the next one.

In making a plea for the further development of co-operative effort among primary producers, Mr. N. W. Frewin, Secretary of the Guyra Bureau and of the Guyra Local War Agricultural Committee, remarked: "We have a difficult year ahead. The war has made many revolutionary changes on the agricultural front, and many more are inevitable. We will have to more and more cultivate a team spirit, by pulling together, working together and encourage a spirit of wholehearted co-operation, not only with our immediate neighbours, but in our area or zone, our district, State and Commonwealth. Arising out of our past experience it would appear that a true co-operative movement or association is the only real and permanent solution of the farmers' difficulties, particularly in relation to the proper and equitable disposal of produce and the purchase of supplies, etc."

The Geologic Sources Of the Commoner Chemical Elements.

Their Agricultural Significance.

(*Continued from page* 74.)

A. N. OLD, B.Sc.Agr., Analyst.

FLUORINE.

THE element, fluorine, second in abundance of the four halogen elements (fluorine, chlorine, bromine and iodine) has a most interesting history. Agricola, in 1529, referred to the mineral we now call fluorspar as "fluores." The etching of glass by the action of fluorspar and sulphuric acid was known in 1670. Scheele, the discoverer of chlorine, suggested in 1771 that an acid was liberated in this action; he called it fluor acid, now known as hydrofluoric acid. Following Humphrey Davy's work in establishing the elemental nature of chlorine, Ampere discussed the analogy between hydrochloric and hydrofluoric acids, and suggested the name fluorine for the new element assumed to be present in the latter. These views were generally accepted, but seventy-four years were to pass before the element was actually isolated by Moissan on 26th June, 1886.

In the intervening years many famous chemists, including Davy and Faraday, had worked unsuccessfully on the problem which has been described as one of the most difficult of modern chemistry. "With fluorine in the world of reality" says Mellor, "chemists were unanimous in placing it at the head of the halogen family, and in that very position which had been so long assigned to it by presentiment or faith."

Occurrence.

Apart from its probable occurrence in minute traces as an occluded gas in some minerals, fluorine cannot be said to occur free in nature. In combination with other elements, however, it is fairly widely distributed and recent work (Shepherd, 1940), tends to indicate an abundance in rocks approaching that of chlorine. The fate of so much fluorine on weathering of the rocks has

not yet been satisfactorily explained. Plutonic rocks are stated to contain about .04 per cent. and lava .01 per cent., though obsidian has an average content of .07 per cent. and sometimes twice that amount. In general, fluorine is more abundant in the acidic rocks, of which obsidian is an instance, than in the basic rocks. In sedimentary rocks the average fluorine content is given as .027 per cent., but samples from the ocean bottom have twice as much.

The most common fluorine minerals are fluorspar or fluorite (calcium fluoride, CaF_2), cryolite (a double fluoride of sodium and aluminium, $3NaF. AlF_3$) and apatite. There are two varieties of apatite—chlor-apatite, $3Ca_3P_2O_8$. $CaCl_2$ and fluor-apatite $3Ca_3P_2O_8$. CaF_2—while many examples have an intermediate composition. Apatite is an important mineral, being the primary source of almost all phosphate; it is almost universally present in igneous rocks though usually in small amounts.

Fluorite (the name derives from the Latin —fluere, to flow—since the mineral melts readily) is used as a flux and purifying agent in the extraction of iron, aluminium and lead from their ores. Smaller amounts are used for the production of hydrofluoric acid, for enamels, opalescent glass, apochromatic lenses, and ornamental work. The United States of America (35 per cent.), Germany (28 per cent.), Russia (14 per cent.), and Great Britain (8 per cent.), are the chief producers, world output being in the vicinity of 500,000 metric tons annually. New South Wales production (total) up to the end of 1938, was 10,112 tons, valued at £31,531.

Cryolite, occurring chiefly in West Greenland, is used in the electrolytic production of aluminium from bauxite and for the manufacture of sodium and aluminium salts and white glass. Fluorine is invariably present in the mineraloid collophane, the essential constituent of phosphate rock, which is the raw material for superphosphate manufacture. Amblygonite, a lithium aluminium fluophosphate is an ore of lithium; it occurs in New South Wales at Euriowie, north of Broken Hill. Of the many silicate minerals containing fluorine, the best known are topaz, tourmaline and lepidolite (lithium mica).

Fluorine compounds are almost always present in small amounts in natural waters, particularly in those of volcanic districts; considerable amounts are given off by volcanoes and fumaroles. Almost all organic tissues contain the element, a fairly large proportion occurring in teeth and in bones, where its presence was recognised as far back as 1805. The percentage of fluorine in fossil bones and in rock phosphate, varies considerably and appears to be correlated with their geologic age. In general, the older the material, the more fluorine it contains, the enrichment being attributed to the action of percolating waters containing fluorine.

Island deposits of phosphate, such as those of Nauru, from which Australia draws the bulk of its supplies, contain less fluorine than continental deposits which are generally of greater age. The following analyses are from the United States Department of Agriculture, Bulletin 364.

	Percentage of Fluorine.
Florida phosphate	3.91
Tennessee phosphate	3.62
Montana phosphate	3.52
Wyoming phosphate	3.40
Algerian phosphate	3.65
French (Somme) phosphate ..	2.89
Russian (Saratoo) phosphate ..	2.73
South Australian (Pt. Clinton) phosphate	3.32
Island Deposits—	
Ocean Island phosphate ..	2.97-3.29
Christmas Island phosphate ..	1.05-1.32
Nauru Island phosphate ..	2.10-2.62

Five phosphatic substances on the local market analysed at the Chemist's Branch (M. S. Benjamin, unpublished report) gave the following results:—

	Percentage of Fluorine in material as supplied.
A ground rock phosphate ..	2.511
A superphosphate	1.360
A di-calcic phosphate	0.127
A bone meal (commercial sample)	0.068
A bone meal product (containing upwards 50 per cent. moisture and volatile matter)	0.033

There is no convincing evidence that fluorine is an essential element for either plants or animals, in spite of its almost universal occurrence in them.

Fluorine Poisoning.

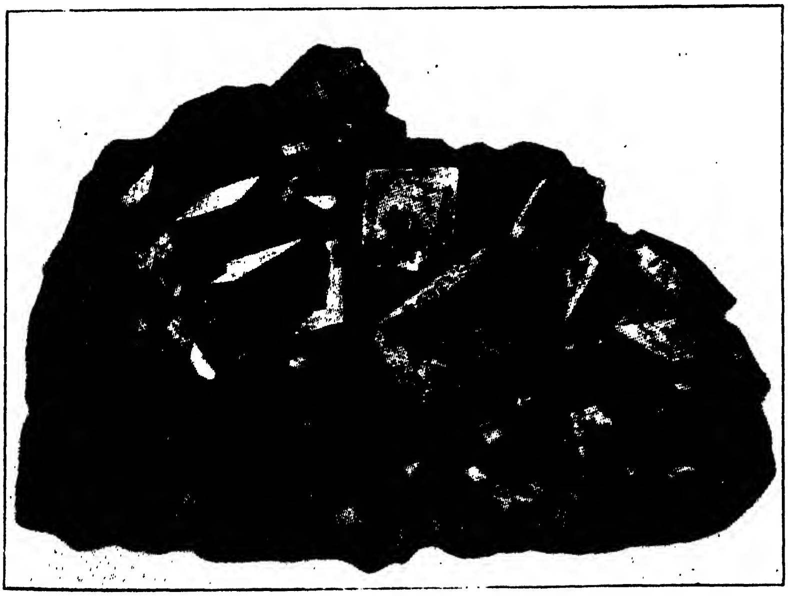
Much attention has been devoted in recent years to certain harmful effects in man and animals resulting from the ingestion of excess fluorine. A disease of domestic ani-

mals particularly sheep, characteristically appearing after volcanic eruptions in Iceland and now known to be due to fluorine, was described at least as early as the year 1100. A similar outbreak of disease followed the 1845 eruption of the volcano Hecla. A disease known as "Darmous," involving dental and skeletal abnormalities and affecting humans, horses, cattle and sheep in Algeria, Morocco, and Tunisia is due to chronic poisoning by fluorine derived from the phosphatic deposits of that area.

Harmful effects on vegetation and stock have been observed in the neighbourhood of factories emitting fluorine effluent and dust; factories producing superphosphate, hydrofluoric acid, glazed bricks, copper, aluminium, glass, and enamel have been cited in this connection.

The danger from hydrogen fluoride and silicon fluoride from such factories is increased by their ability to form fogs and remain in a given locality for lengthy periods if wind is absent. In 1930 such a fog in the Meuse Valley, Belgium, where there are many industries using fluorine compounds, killed sixty persons and large numbers of stock.

The fluorine content of phosphatic licks for farm animals is of importance, and careful selection of the calcium phosphate from which such supplements are prepared, is advisable. It is possible to remove almost all fluorine from rock phosphate by steam calcination.



Crystals of Fluor-spar.
[*After Spencer*

Mottled Enamel or Dental Fluorosis.

A condition of the teeth of children known as mottled enamel, occurring in parts of almost all countries of the world, is associated with areas where the fluorine content of the drinking water exceeds one part per million. The effect is particularly well known in some parts of the United States of America.

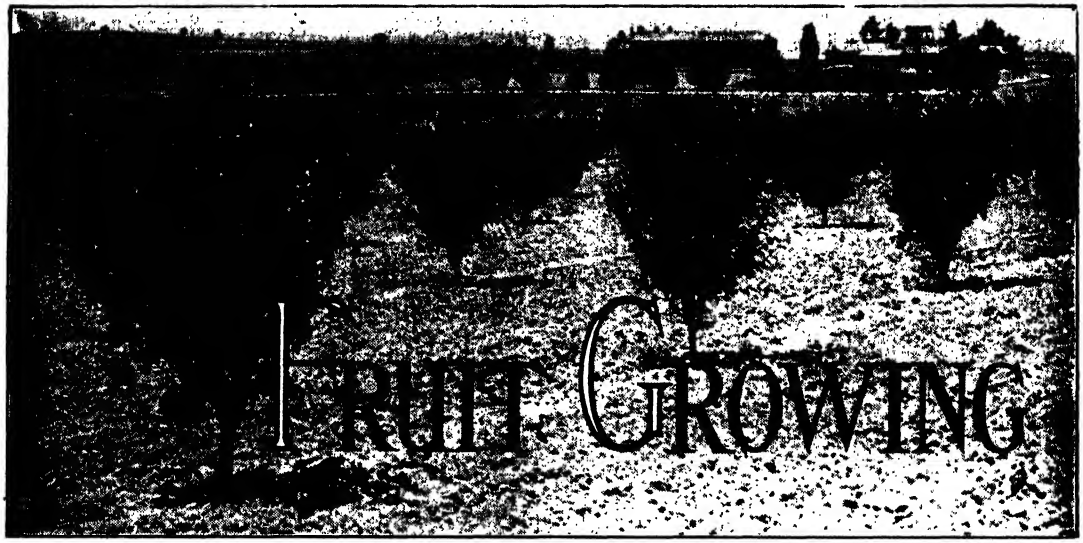
In 1937 mottled enamel of teeth was observed in Queensland at Julia Creek and Thargomindah, where the drinking water, obtained from deep artesian bores, was found to contain 3.0 and 1.6 parts per million of fluorine respectively. The substitution of tank water during the period of enamel development was recommended.

A peculiar aspect of the association with fluorine is that teeth affected with mottled enamel are apparently more resistant to dental caries.

Fluorine in Insecticides.

In addition to the uses of fluorine compounds already referred to, their value as insecticides should be noted. The best

(*Continued on page* 147.)



Extending the Storage Life of Apples

By the Use of Skin Coatings.

FOR the past three seasons extensive experiments on the skin coating of apples have been carried out in New South Wales at the Homebush Laboratory, and in 1942 at country centres by the Council for Scientific and Industrial Research and the New South Wales Department of Agriculture. Following on successful experiments in the laboratory, large scale trials were carried out in 1942 at Batlow, Orange, Crookwell and Armidale. Large scale experiments have also been carried out in Tasmania, where about 60,000 bushels of apples were treated successfully in 1942 by the Australian Apple and Pear Marketing Board under the supervision of the Council for Scientific and Industrial Research. Smaller trials have also been carried out in South Australia and Victoria by officers of the State Departments of Agriculture. The results given here relate only to fruit grown in New South Wales.

It has been shown that a very thin film of wax, oil or other suitable protective material applied to apples prolongs their life, retards yellowing to a marked degree and reduces wastage from certain storage disorders. Fruit treated with a suitable coating is also of better flavour, firmer, generally less wilted and generally brighter than untreated fruit. Such skin coatings are particularly valuable for increasing the life of apples in common or unrefrigerated storage and the life during and after cool storage is also increased by treatment. Treated apples can also be cool stored at temperatures above those at which certain cool storage disorders may develop without the reduction in storage life which usually follows cool storage at higher temperatures. The effect of such coatings is due to the fact that the diffusion of oxygen and carbon dioxide through the skin of the fruit is restricted; consequently the life processes of the fruit are slowed down and therefore its storage life is increased.

Types of Coatings.

The most satisfactory coatings are those formed from certain oils, waxes and dewaxed shellac.

Castor oil and dewaxed shellac are soluble in alcohol, which is the only suitable solvent that can be used without injuring the fruit. Consequently a mixture of castor oil and shellac dissolved in alcohol can be used, and such a preparation has given very satisfactory results with a num-

ber of varieties. All other oils and waxes have to be prepared as emulsions, using special soaps. Such emulsions have their special uses, but have not been as generally effective as the alcoholic solution of castor oil and shellac.

As the alcoholic solution drys very quickly and leaves no contact marks, it is particularly suitable for treating the fruit by hand dipping methods. In use the solution becomes more concentrated through evaporation of the alcohol, and this stronger solution may cause the subsequent development in treated fruit of core browning, alcoholic flavours or breakdown. Alcohol should, therefore, be added from time to time at the rate of, usually, ½ to ¾ gallon for every 30 bushels treated, to bring the solution back to its original strength. The strength of the solution can be determined by titrating with caustic soda solution in the same way as the maturity test for oranges is carried out.

Alcohol is inflammable and the necessary precautions should be taken when the solution is being used.

The emulsions are more difficult to prepare, but can readily be manufactured commercially in a concentrated form, and then only require dilution with water for use. However, they dry slowly and leave contact marks when hand dipping methods are used, but can be applied very satisfactorily in a machine which incorporates a hot air drying tunnel. A large number of emulsions of waxes and oils have been prepared and tested on fruit in the laboratory, and some of these have given good results in larger trials.

Methods of Application.

Hand Dipping.—This method is very satisfactory when the alcoholic solution is used, and large quantities of fruit can be treated inexpensively by the grower, as special equipment for drying the treated fruit is not necessary. The only equipment required is a tank to hold the solution, several perforated dipping boxes or baskets and a gently sloping drainage table of corrugated sheet iron along which the solution drained from the freshly dipped boxes of fruit runs back into the tank. A suitable dipping tank in which the fruit can be treated in case lots using a standard bushel size dipping box, would be 22 inches long, 14 inches wide and 16 inches deep, and could conveniently be made from galvanized iron. A reinforced, specially smoothed hardwood or hemlock bushel case, fitted with rope handles and perforated for rapid drainage, makes a suitable container for dipping the fruit.

In operation the fruit is gently transferred from the field case to the dipping box; this can readily be done by placing the empty dipping box on top of the full field case and carefully inverting the two cases. The dipping box is then submerged for a few seconds in the tank of solution, care being taken to cover every apple, and then drained on the drainage table for a minimum of two minutes. After draining the fruit is transferred back to the original boxes, which are not stacked up for storage for a few hours in order that the fruit will be free to dry. It is desirable to raise the cases off the floor during this time, by placing them on 3 x 2 inch studs. If several dipping boxes are used, the boxes can be thoroughly drained while others are being filled and dipped. By this method one man can treat 20 to 25 bushels of fruit per hour.

Machine Treatment.—A suitable machine consists of a tank to hold the solution or emulsion, an elevator with under-drainage back to the tank, which elevator carries the fruit from the tank to a drying tunnel through which the fruit is slowly carried against a current of hot air and from which it is discharged into a bin for boxing. Such a machine will rapidly handle fruit treated with castor oil and shellac in alcohol, and its use is practically essential for treating satisfactorily large quantities of fruits with emulsions. Such plants are in operation for waxing oranges.

Cost of Coating.

The cost of the materials for the alcoholic solution of castor oil and shellac is approximately 3s. per gallon. If the solution, which is easily prepared, is made up in bulk at a central point in each district the cost to the grower should not be much more than 4s. per gallon. One gallon of solution is sufficient to treat 25-30 bushels of apples. The cost of hand treatment, including labour, would be approximately 4d. per case.

The cost of the concentrated emulsion would be about 10s. per gallon from the manufacturer. As the concentrated emul-

sion is diluted with one part of water before use, 1 gallon will treat 50-60 bushels of apples. The cost of treatment for materials and labour would therefore also be about 4d. per case.

Results Obtained with Various Coatings.

The best results have been obtained with castor oil and shellac in alcohol. Under favourable conditions the use of this preparation has increased the life in common storage of Jonathan, Delicious, Granny Smith and Democrat apples in New South Wales by 50 per cent.

The most striking effect of treatment has been a marked retardation of yellowing, and treated Granny Smith apples have remained green for five months in common storage. In almost all cases treated fruit was less wilted, firmer, crisper and more juicy than untreated fruit, and flavour and acid were retained much better. Treatment with castor oil and shellac in alcohol sometimes caused lenticel spotting on the Jonathan, Granny Smith and Rome Beauty varieties, but it was generally slight on fruit treated at the right stage of maturity. Treatment has consistently practically controlled Jonathan spot, greatly reduced the incidence of bitter pit and delayed the development of mealy breakdown. In most cases, with varieties other than London Pippin, which is unsuited to common storage and with which the treatment was not successful, mould wastage was not increased by treatment with castor oil and shellac. The film on fruit treated with this solution is somewhat sticky at higher temperatures in common storage, but when temperatures are lower, as when the late varieties are treated in this State, and in Tasmania or in cool storage, the coating is satisfactory.

Oil emulsions were less effective than the alcoholic solution, but more effective than wax emulsions in retarding yellowing and softening. They tend to increase wilting of the fruit, which, however, is effectively controlled when wax emulsions are used. Wax emulsions, which also reduce Jonathan spot and bitter pit, although they do not markedly retard yellowing, are valuable for Jonathan, which wilts badly in common storage. The emulsions so far prepared for treating fruit, either experimentally or commercially, are alkaline in reaction and may cause browning around the calyx similar to that caused by alkaline washes sometimes used for spray residue removal. An emulsion of peanut oil was used in large scale trials and, although it increased wilting and made unwrapped fruit very sticky, it was more effective than wax emulsions in retarding yellowing, softening and loss of flavour, and considerably reduced the development of superficial scald in cool stored Granny Smith apples.

Concentration of Dip.

In most commercial scale trials with castor oil and shellac, a 10 per cent. solution


IN PEACE
and WAR
Mobiloil
Serves the Nation
on Land, Sea
and in the Air
VACUUM
QUALITY PRODUCT
VACUUM OIL COMPANY PTY. LTD. (Incorporated in Australia)
M34

of either four or two parts of castor oil to one part of dewaxed shellac has been used, but injurious effects were produced when the fruit was immature or when prevailing temperatures were high. Some trials with weaker solutions were carried out, and it is considered that the best strength for general use on apples is an 8 per cent. solution of two parts of castor oil to one part of dewaxed shellac. For oil emulsions a concentration of 10 per cent. seems to be most satisfactory. Wax emulsions may be used in higher concentrations, although a 10 per cent. emulsion will usually control wilting and reduce wastage from Jonathan Spot.

Precautions to be Observed in Treating Fruit.

It has been found that the maturity of the fruit at the time of treatment is of critical importance. When castor oil and shellac is used, immature fruit should not be treated; such fruit, particularly if the temperatures are high, is very liable to develop alcoholic off-flavours, skin and core browning and even breakdown after treatment. Furthermore, treated fruit does not ripen and develop flavour to the same extent as does untreated fruit, so that apples should be sufficiently mature to be palatable when treated. This particularly applies to fruit treated with castor oil and shellac. If fruit is over mature when treated, the development of lenticel spot and mould will be increased.

For treatment, dessert varieties should have a green-yellow ground colour, and should be juicy with a fair amount of flavour. Green varieties, such as Granny Smith, should be treated when the ground colour is light green to yellow-green; if the ground colour is deep green the fruit is immature, and if it is on the yellow side it is over mature. Thus, in general, fruit for treatment should be at the optimum maturity for cool storage when picked.

It should be clearly understood that, unless the fruit is in good condition, free from injuries and handled carefully, its life, even after treatment, may be considerably reduced by the onset of mould. Very large and very small fruit should not be treated, as the former does not keep well and both seem more likely than fruit of normal size to develop alcoholic flavours under adverse conditions. Treatment should be carried out within a day or two from picking; it is particularly important with the earlier varieties that there should be little delay between picking and treatment.

Treatment of fruit with castor oil and shellac should be avoided during very hot weather as under such conditions even mature fruit is liable to develop off flavours. The fruit should be kept as cool as possible after treatment, particularly for the first few days. For this reason as well as for the reason that castor oil and shellac does not always reduce wilting in Jonathans a wax emulsion may be better for this variety when temperatures are high.

Recommended Coatings.

The most generally effective treatment was castor oil and shellac in alcohol, and it is recommended that an 8 per cent. solution of two parts of castor oil to one part of dewaxed shellac should be used on Granny Smith, Democrat, Delicious and Rome Beauty apples for common storage, and on Democrat, Delicious, Rome Beauty and Jonathan apples for cool storage. For Jonathans in common storage, a 10 per cent. wax emulsion may be better as it controls wilting. A 10 per cent. emulsion of peanut oil seems to be best for Granny Smiths in cool storage, provided that they are wrapped in plain paper, as it is considerably more effective than the solution of castor oil and shellac in reducing the incidence of superficial scald.

Growers who contemplate treating apples for storage are advised first to consult their local Fruit Instructor or write directly to the Department's Fruit Storage Officer at the Food Preservation Laboratory of the Council for Scientific and Industrial Research at Homebush.

Don't Let Secrets or Rumours Get Any Further Than You!

The Care and Maintenance of Orchard Machinery and Equipment.

E. C. WHITTAKER, Fruit Instructor.

THE care and maintenance of the farm plant is a matter which should exercise the minds of all primary producers at the present time, as, owing to the demands of war industries on supplies of raw materials used in the manufacture of the various items of farm equipment and for technicians engaged in the manufacture and repair of such articles, it is obvious that better use of machinery is essential if shortages and hold-ups are to be avoided. It therefore devolves on every grower to take the best possible care of what he has in the way of machinery and other farm plant, with the object of making it last—if at all possible—until better times come again.

The Spray Pump is Perhaps the Most Important Piece of Orchard Equipment

Careful maintenance will make it last longer.

It can be said that, on the whole, most growers look after their plant in a reasonably satisfactory manner, but all the same far too often one finds items of expensive equipment such as spray outfits, ploughs, and even occasionally a tractor or lorry, left out at the mercy of the elements under a tree and sometimes not even given that protection. Such slovenly practices as this are wasteful and reprehensible enough even in peace time, but at the present juncture amount to little short of gross carelessness.

An implement shed need not be a very elaborate or costly structure in comparison to so many of the items of plant which can be housed in it, and a shed deteriorates but little from weathering in comparison to many types of machinery; hence those growers who have neglected to provide themselves with such a shed are urged to make an effort to provide some protection for their working plant without further delay.

The Spray Outfit.

On an orchard the spray outfit is an item of the utmost importance, and often the most expensive, and yet for some reason or other is very often somewhat neglected, so far as care and maintenance are concerned. An orchardist without an efficient spray outfit these days is in a precarious position, and as new outfits are already hard to obtain growers should not need any urging to induce them to take particular care of their spray plants.

During the spraying season, little beyond ordinary maintenance measures are possible, but it is well to remember that oil and grease are a lot cheaper than metal. All moving parts should be properly lubricated and also, if not provided for by the makers, some sort of protection should be afforded the pump and engine against spray and accumulation of dust, grit, etc. If spraying is completed for a week or two, an effort

should be made to keep the outfit under cover, but before doing so the whole system should be flushed out by pumping a few gallons of clean water through, and above all, during the hot weather do not forget to keep the vat full of water—all the time.

At the end of the spraying season, a day or two given to the outfit prior to putting it away can be time very well spent.

If the break is to be for any length of time, it is a wise move to clean down, and, if possible, paint all woodwork and exposed metal surfaces, for paint is easier and cheaper to replace than wood and metal. Make sure that the engine and pump are in good order, and if any repairs or replacements are necessary attend to them at once—do not wait until next season, or very likely there will be an important spray missed or put on too late. Hoses will probably be particularly hard to replace in the near future; hence, see that they are thoroughly cleaned of all oil or spray accumulation, and then properly drained and hung up in a good dry place.

Ploughs, cultivators, drills, vehicles of all sorts, and even the spade and hoe, etc., all benefit by a little attention occasionally and protection from the weather and rust.

Packing Shed Equipment.

In the packing shed, the sizing unit should have fairly frequent attention, and apart from the ordinary maintenance jobs of lubrication and adjustments, all rollers, belting and bins should be scrubbed down from time to time—especially late in the season when Granny Smith apples or similar waxy varieties are being put over the sizer. The accumulation of dust and fruit wax, etc., on the sizer parts is not only detrimental to the fruit passing over, but often becomes so bad as to cause a marked falling off in the efficiency of the machine.

In the larger packing sheds where the plant is working at more or less full capacity most of the time, it is suggested that the sizers be attended to in this respect at least once a week. A little washing soda in warm water, or a suitable proprietary product will be found most useful when dealing with these wax and dirt encrusted belts and rollers.

Harness of all kinds should be attended to regularly. High-grade leather, of a type suitable for harness making, is in much demand for other purposes, hence replacements may be hard to get before long. A little of one of the many well-known harness dressings, such as neatsfoot oil, rubbed into the leather at reasonably frequent intervals, may make a lot of difference to the eventual life of the article.

In conclusion, it is well to reflect that the old saying "Waste not, want not" is particularly apt to-day, especially when applied to machinery; and in eliminating to the best of his ability all wastage by neglect of plant and the consequent wastage of manpower on repairs and replacements, a grower at least has the satisfaction of knowing that he is making a definite, even if small, contribution to the national war effort, and at the same time is safeguarding his own particular and immediate interests.

Swine Fever—Need for Vigilance.

THE Minister for Agriculture, Mr. Dunn, has announced that, so far, with the exception of isolated outbreaks at Hay and Albury, the presence of swine fever has not been confirmed anywhere outside the County of Cumberland. Suspicious outbreaks of disease in the northern parts of the State have been investigated, but none have been found to be outbreaks of swine fever.

The progress of this outbreak has been a matter of considerable interest to other organisations apart from the Department of Agriculture, and the Department has been in close touch with the Deputy-Controller of Defence Foodstuffs. Comments on the progress of the outbreak have been made by that organisation, and in a recent report to the Minister, the Deputy-Controller states that "although the position is serious as regards supplies of pig meat, it could easily have been much worse, and become a disaster of the first magnitude. That such has not developed is due to the capable and energetic control measures taken by the Minister of Agriculture and staff officers."

The Deputy-Controller realises that the danger has not yet passed, and the Minister desires to emphasise this fact. As outbreaks are so closely associated with the feeding of unboiled garbage, the Minister desires to draw the attention of all persons who are feeding garbage, no matter what the source of the garbage may be, to the necessity for very thorough boiling, and for taking the utmost care that no unboiled garbage can be consumed by pigs. The Department views as very serious certain instances in which careless handling of the garbage has been noted. Persons who are guilty of such action might easily be responsible for a fresh flare up of the disease, with very heavy economic loss to the State, and serious repercussions on the supply of food for defence purposes.

PLANT DISEASES

Notes contributed by the Biological Branch
Division of Science Services

DISEASES OF PEAS.

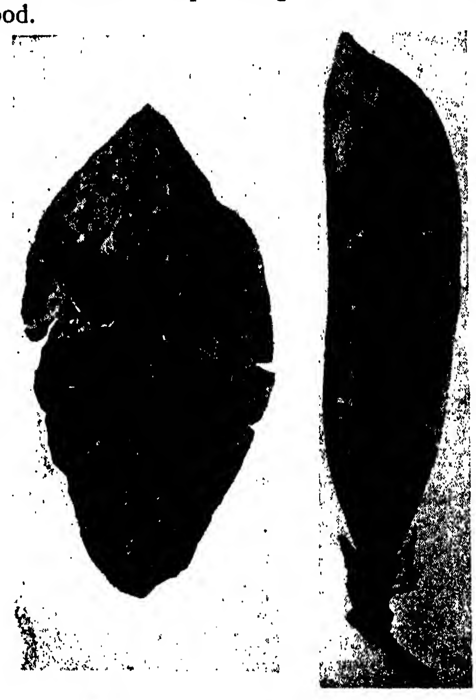
Mycosphaerella Blight.

IN New South Wales, by far the most serious disease of peas of that group causing leaf and pod spotting, is Mycosphaerella Blight. This seed-borne fungous disease attacks the leaves, pods, stems and basal portion of the plant. Brown to purplish irregular spots with indefinite margins develop on the leaves. Frequently, during periods of wet weather, the spots become larger, circular and somewhat zonate. Similar small spots appear on the pods. These may run together producing large, irregular purplish areas. The first sign of this disease on the stems, is the appearance of black to purplish streaks, which become more pronounced at the leaf junctions with the stems. These streaks may enlarge into brown, or even purplish, areas ring-barking the stem. Frequently this may develop as a foot-rot and spread up the stem many inches, resulting in the ultimate death of the plant.

Bacterial Stem Blight.

This serious seed-borne disease of peas is caused by a bacterium, the early signs being small, watersoaked spots on the stems, stipules and leaflets. The spots on the stems are watery areas, green-brown in colour, whilst on the leaflets the affected areas have a watery, bruised appearance.

Young plants may wilt and be killed outright, whilst older plants may survive but be stunted. Infected flowers and young pods are often killed, whilst the disease on older pods is apparent as rounded, water-soaked yellow-brown spots, or even as water-soaked strips along the back of the pod.



Mycosphaerella Blight, showing the Typical Spotting of Pod and Leaflet.
Blackening of the base of the stem, or foot-rot, is also a sign of blight.

Bacterial Stem Blight of Peas.
Watery bruised areas on the stipules and dark green areas on the stem distinguish stem blight from other pea diseases.

Powdery Mildew.

This disease is introduced from season to season in the seed, or by carry-over in the field on diseased vines. The disease is apparent as a white, powdery, dust-like coating on the surface of the leaves, stems and pods. Dwarfing and twisted growth may be produced, and in severe infections the vines may be killed. The disease is favoured by relatively cool conditions, and is usually checked by very hot weather. It can develop under fairly dry conditions, but seldom makes its appearance in a crop before the plants begin to flower.

Downy Mildew.

This disease is not usually severe in this State, but periodically it may cause losses during cool moist weather conditions. The disease is apparent as angular, yellowish-brown spots on the leaves, while on the under-side of the affected areas a greyish, downy growth of the mildew appears. This disease is usually not sufficiently troublesome to warrant application of control measures.

Root Rots of Peas.

Several organisms are known to produce this condition in peas, and for practical considerations may be treated together. These causal agents are natural soil-inhabiting fungi, which are present to some extent in most fertile farming land. The symptoms of root rot are apparent as a discoloration and decay of the stem and root, at and about soil level. The leaves become yellowish, and the plant may finally succumb. Control is difficult, and continually cropping the same land with peas will render this disease more serious.

Fusarium Wilt.

This disease is apparent as a stunting and wilting of the plant. The leaflets and stipules characteristically turn a pale yellow-green and roll downwards at the margins.

Root rot is not usually produced, but the interior water-conducting tissues of the stem assume a lemon to pale brown discolouration due to the invasion of the fungus.

Spotted Wilt.

Appreciable losses are sometimes caused in peas by infection with the tomato spotted wilt virus. The disease is recognised as necrotic streaks on the stems, purplish to bluish brown in colour, which may extend

Powdery Mildew on Pod and Leaves.
[*After Brown and Evans.*

only slightly or involve the entire length of the stem. One-sided development of the plant is common, while spotting and vein necrosis occur on the young leaves and pods.

Downy Mildew of the Pea.
Note the typically profuse growth of the downy mildew fungus on the undersides of the leaves.
[*After L. L. Harter et alia.*

Mosaic.

Although this disease is fairly widespread, only slight economic loss is generally caused by it. Generally characteristic symptoms are produced on the more mature plants. Leaves affected show the intermixing of light and dark areas characteristic of mosaic diseases in general. Tall vine varieties are said to be more seriously affected than canning types.

Control Measures.

Seed Selection.—Since several of the more important diseases of peas are seed-borne, the most effective method of controlling these diseases is to ensure that only the best seed, saved from seed-crops free of disease, is planted. A step in this direction has been initiated recently by the Department of Agriculture in building up stocks of disease-free mother seed, and it is hoped that in the near future, pea seed reasonably free of serious seed-borne diseases will be available to growers.

The harvesting, threshing and care in after-handling of pea seed are important phases of pea seed production that can vitally affect the quality of the commercial grower's crop. Seed that is cracked by careless harvesting and threshing methods or seed that has been allowed to become mildewed because of improper aeration of the pea vines in the stack, can be largely responsible for faulty germination trouble. Dusting this seed with fungicides can, at the most, only partially correct such troubles.

Crop Rotation.—As far as practicable, an endeavour should be made to practise rotation of crops. Many of the pea diseases are carried over in the soil and also on diseased pea refuse. Continuous cropping of the same land can result in a serious building-up of disease-producing agents in the soil, thus rendering the land uneconomic for pea growing. Long rotations are preferable, but shorter ones of three to five years are frequently quite successful.

Seed Disinfection.—All pea seed should be dusted prior to sowing with a copper dust

Root Rot of Peas.
Note the darkened area of the upper part of the root and stem, and the stunted appearance of the plant.

(copper oxychloride) at the rate of 2 oz. per bushel, or with an organic mercury dust ("Agrosan," "Ceresan," "Zetan") at the rate of 1 oz. per bushel. Pea seed which has been treated with a nodule-producing bacteria should not be dusted.

Fusarium Wilt of Peas.
Note that the leaves turn yellow and have a tendency to roll downwards at the margins; also the wilting of the terminal shoot.

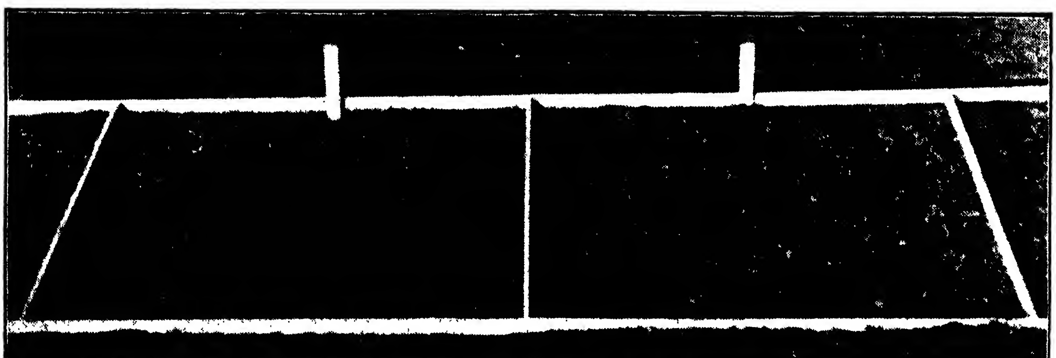
Dusting with Sulphur.—Where powdery mildew is serious, dusting the plants with a sulphur dust preparation (equal parts of fine dusting sulphur and hydrated lime) when the flowers are commencing to appear, has been found effective. Subsequent applications may be made at intervals of about ten days, although two dustings have usually been found to give adequate control.

Poor Germination of Pea Seed.

Low germination in pea seed may be caused by a number of different causes which it is not possible to discuss here. The ultimate effect is that the pea seed or the young pea plant rots and does not appear aboveground. Seed treatment recommended earlier as a means of seed disinfection also acts as a seed protectant and is an insurance of good germination, unless the seed is very poor indeed. The following are some germination figures from last year's trials of the Biological Branch of treatment of pea seed before planting, which should impress most farmers:—

Date.	Variety.	Un-treated.	Treated.
1942.		Per cent.	Per cent.
26 June ...	Gem (U.S.A.)	49	95
	Greenfeast (N.Z.)	73	88
	Greenfeast (U.S.A.)	45	76
	English Wonder	27	81
	Richard Seddon	39	82
	Richard Seddon	23	80
	Witham Wonder	31	83
30 July ...	C.J.T. Greenfeast	46	90
	C.L.W. Massey	60	96
	C.F.P. Greenfeast	57	90
	C.W.A. Greenfeast	70	99
	C.W.A. Greenfeast	76	90

It will be noticed that good germination was obtained with all lots of seed following dust treatment. The recommended dusts are copper oxychloride (used at the rate of 2 oz. per bushel) or one of the proprietary



Germination of Pea Seed from One of the Plots, where the Difference was Very Striking.
Left.—Untreated, 33 per cent. germination. *Right.*—Treated, 80 per cent. germination.

organic-mercury dusts (Agrosan," "Ceresan" or "Zetan"), used at the rate of 1 oz. per bushel of seed.

Seed which has been, or is to be inoculated with legume-nodule bacteria should not receive dust treatment.

SEPTORIA SPOT OF CITRUS.

Recommendations for Control.

THE autumn of 1942 in the Murrumbidgee Irrigation Area was showery and conducive to the development of Septoria Spot, and a number of orchards, especially at Leeton,

Septoria Spot on Navel Orange.

were affected. It was the first severe test of the efficiency of the various sprays which have been applied annually at Leeton since 1939.

The following sprays were used in the 1942 trials, applied in late March: Bordeaux mixture 5-5-100, Bordeaux mixture 2½-2½-100, and copper oxychloride 1 lb. to 100 gallons. White oil was added at the rate of ½ gallon per 100 gallons of spray in each instance.

With Navel oranges almost complete control was effected by all the sprays. Unsprayed trees showed up to 50 per cent. badly affected fruit, whereas on sprayed trees there was scarcely a trace of spot.

Control of spot in the Valencia crop was not so complete. Bordeaux 5-5-100-½ was the most satisfactory spray, giving almost 100 per cent. clean fruit, but a small percentage of spot showed up on fruit sprayed with the weaker Bordeaux and the copper oxychloride sprays. A Bordeaux mixture 5-5-100 was applied to the south side of the tree in one series of experiments, but this is regarded as an unsatisfactory spray because of the development of spot near ground level on the unsprayed side.

Growers who suffer annual losses would be well advised to make a routine practice of spraying in February-March, before the autumn rains. Where spraying is carried out annually and losses are not severe, the weaker Bordeaux or copper oxychloride sprays should be adequate. Where Septoria has been serious or the weather promises to favour spot infection, the stronger spray is recommended. The application should be made by the end of March at latest.

Where fumigation for scale insect control is necessary, this should be done before, not after, spraying, and several days should elapse between treatments.

Railways Do Good Job.

SHEEPMEN in the Guyra district are loud in their praise of the excellent services rendered by the New South Wales Railways in the handling of last season's wool clip. As can be readily understood, the added burden placed upon the railways by the fighting services makes it extremely difficult to cater for civilian needs. In spite of all difficulties the Railways are still doing a good job.

At the recent annual meeting of the Guyra Branch of the Agricultural Bureau, the following resolution was passed and forwarded to the Railway Department:—

"That members of this Bureau, representing the landholders in this area of New England (embracing Llangothlin, Black Mountain, Bald Blair and districts on the western side of Guyra), wish to express their appreciation to the Railway Commissioners for the efficient and satisfactory manner in which they promptly handled and despatched the 1942 season wool clip, and we make special mention of the whole-hearted co-operation received by the railway staff at Guyra, where the bulk of the above-referred-to wool clip was handled."

INSECT PESTS.

Notes contributed by the Entomological branch.

Mole Crickets (*Gryllotalpa* spp.).

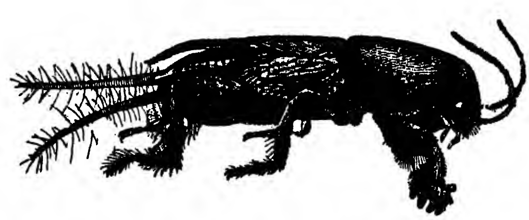
ON a number of occasions during the past month mole crickets have been recorded causing serious damage in seed beds, by burrowing through the soil beneath the plants.

In their immature and adult stages mole crickets may cause extensive injury to lawns, golf and bowling greens and tennis courts; their horizontal tunnelling just beneath the soil level destroys the smooth surface of the turf and causes injury to the grass. In addition, small mounds of soil are frequently thrown up amongst the grass causing further unevenness. More than seven hundred mole crickets have been taken from a single golf green.

Mole crickets may also occur in numbers in gardens, but well-rooted plants do not usually suffer appreciable injury. Where crickets occur in seed beds, however, they may cause serious damage by churning up the soil, thus causing the small plants or germinating seeds to die.

Some seven species of the genus *Gryllotalpa* are found in Australia, and of these, two species, *G. africana* an introduced form, and *G. australis*, occur as pests in New South Wales.

Both are dull, yellowish-brown to dark brown insects, with black eyes, and measure about $1\frac{1}{4}$ inches in length when mature. Their powerful front legs, which are greatly modified for digging, are broadly flattened and bear tooth-like projections. The soft wing covers (tegmina) are short and rounded, while the hind wings which are well-developed, are folded when not in use and project backwards beyond the wing covers. At the tip of the abdomen there is a pair of feeler-like appendages or cerci. Although the adults are able to fly they are seldom observed in flight.



An Adult Mole Cricket.

The adults live in galleries under the soil, and usually prefer sandy soils in moist situations. They construct vertical shafts, about 6 inches or more in depth at the ends of their galleries. Occasionally, at night, they come out into the open, but always shelter in the vertical tunnels during the day.

Mole crickets are omnivorous feeders and burrow through the ground and amongst the roots of plants to obtain earth worms and various insects. They also feed on organic matter in the soil, grass roots, the roots and stems of seedlings, the roots of maize, sugar cane and vegetables, and also gnaw through succulent stems at ground level. There are also records of mole crickets collecting germinating wheat and other seeds and storing them in circular chambers some 6 to 12 inches underground, and in some instances they have been known to remove every seed from areas several square yards in extent. Cannibalism also occurs amongst them and the younger forms succumb to the attacks of mature specimens.

Mole crickets are able to produce loud stridulations or songs by vibrations of the wing covers, upon which are situated special structures or files. Their organs of hearing or "ears" are situated on the tibiae of the front legs.

Mole crickets may be attacked by mites, parasitic nematode worms and thynnid wasps.

Life History.

The females construct one or more egg-chambers and in these they deposit their eggs. About 200 eggs have been found in a single chamber. The eggs, which are ovoid, measure slightly less than $\frac{1}{8}$ inch in length and are brown in colour. The

newly-hatched crickets, which measure about one-fifth of an inch, are active and greyish-brown in colour, and they increase in size by a series of six moults before reaching the adult stage. In their immature stages they resemble the adults in general form, but lack wings.

Egg-laying has been observed from November right through the summer months, but the young which hatch from these eggs do not reach maturity until the following spring and summer; and while there appears to be only one generation each year, all stages may be observed during the summer months because of the prolonged oviposition period. In general, however, adults predominate in the early summer while immature forms are mainly seen in the late summer and through the autumn and winter.

Control.

As previously stated, the presence of mole crickets may be detected by the unevenness caused to the ground or grass, by the horizontal tunnels and the small mounds of earth. If the horizontal tunnels are followed, the vertical shafts, in which the crickets shelter by day, can be located. The introduction of an irritant contact insecticide into these shafts, either by means of a syringe or funnel, will cause the sheltering crickets to make their way to the surface, where they can readily be collected and destroyed.

It is essential that any mixtures used should not injure the grass or other plant life. A satisfactory solution for this purpose is a nicotine sulphate and soap solution, used at the rate of—

Nicotine sulphate ..	1 fluid oz.
Hard soap	3 oz.
Water	4 gals.

Derris powder is not obtainable at present, but it may be mentioned that the following mixture—

Derris powder ..	1 oz.
Soft soap	3 oz.
Water	3 gals.

and also a proprietary insecticide containing derris, are both very effective mixtures.

Under certain circumstances a kerosene emulsion may be used to bring the crickets to the surface, but concentrated solutions of this emulsion will cause burning of grass roots around the treated areas.

An emulsion of eucalyptus prepared with soft soap has also been found effective.

Where areas are heavily infested, locating the vertical tunnels and injecting the solution is a very laborious process, and it is easier, although more expensive, to flood the area with one of the above mixtures—a much greater quantity of liquid being required for effective results.

The injection of infested turf with carbon bisulphide is also a very effective method of control. Carbon bisulphide, however, has to be injected with a special injector, so that it can be placed below the surface to a depth of 4 or 5 inches as this chemical is injurious to the grass. To be effective, it is necessary to inject ¼ fluid oz. into at least every square foot throughout the infested area. Carbon bisulphide is an evil-smelling, colourless liquid, which gives off a gas that is toxic to the crickets. It is extremely inflammable and explosive and all lights or fires should be kept well away during treatment.

It has been observed that lawns which have been "grub-proofed" with arsenate of lead are noticeably free of mole crickets. "Grub-proofing" of lawns and golf greens is usually undertaken to control scarab beetle larvae, popularly known as "white curl grubs," and the method generally adopted is to mix 5 lb. of arsenate of lead powder with 1 bushel (approximately 2 kerosene tins) of screened moist (not wet) sand or a good top soil, and then to distribute the poisoned sand or soil evenly over 1,000 square feet of turf. The poisoned soil is applied to the lawn when the grass is dry, and in order to build up a layer of poisoned soil this top dressing is repeated three years in succession.

A Mole Cricket Bait.

A bait which has proved of value for the control of mole crickets in seed-beds consists of:—

Broken rice	5 lb.
Barium fluosilicate ..	4 oz.

The method of preparing the bait is first to moisten the rice with about a pint of water. Then spread out the grain on sheets of paper and scatter the poison over it; mix thoroughly and allow to dry. The bait is then ready for use, or may be stored if not required immediately.

In ground known to be infested, the poisoned rice may be lightly worked into the surface soil some days before planting, or may be broadcast over the surface of the beds if the seeds have already been planted. The bait is best applied in the late afternoon or evening after irrigation or rain, when the crickets come to the surface. The bait remains toxic for a week or more, but as the grain becomes moist in the soil it eventually rots and becomes less attractive. A second treatment after an interval of a week may prove necessary.

Domestic animals are not attracted to the bait but poultry should not be allowed on treated land for at least a week after application of the bait.

White Wax Scale.

(*Ceroplastes destructor.*)

WHERE control of the citrus white wax scale has been neglected, through various circumstances, earlier in the season, and the spray applications have to be made during this month, it may now be necessary to use the more concentrated soda solution that is recommended, if the scales have passed their "peak" stage, and are well-developed.

Late spraying usually necessitates heavy applications of concentrated soda solutions, and thus there is risk of fruit marking or tree injury. Soda or soda-oil sprays may also cause a certain amount of tree injury, but in some districts this latter difficulty is overcome by the use of resin-soda sprays which are much safer in this respect.

Soda sprays should not be applied in hot weather, and trees suffering from lack of moisture should not be treated. Effective control of this scale is only possible by thorough spraying, and if rain falls within about twelve hours after application it may render the action of the soda ineffective.

To make the soda solution either fresh washing soda or soda ash may be used, and if the scales are still in their "peak" stage, they may be controlled with sprays prepared according to the following formulae:—

(1)	Fresh washing soda ..	8 lb.
	Soft soap (spreader)	2 lb.
	Water	40 gals.
	or	
(2)	Soda ash	3 lb.
	Soft soap	2 lb.
	Water	40 gals.

(For small quantities approximately 13 oz. washing soda or else 5 oz. soda ash, 3 oz. soap to 4 gals. water.)

The quantity of soda required is dependent on the stage of development of the scales, so that where they are well-developed it may be necessary to use up to 15 lb. of fresh washing soda, or 5½ lb. of soda ash to every 40 gallons of water (1½ lb. washing soda or 9 oz. soda ash to 4 gallons).

Instead of soap, red oil, at the rate of ½ gal. to 40 gals. (8 fluid oz. to 4 gal.) may be used as a spreader.

If it is necessary to control other scale insects, such as red scale or purple scale, in

The Citrus White Wax Scale.

addition to white wax scale, then either red oil or white oil may be used in combination with the soda, at the rate of 1 gallon to 40 gallons of spray (16 fluid oz. to 4 gal.).

In mixing such combination sprays, the soda should first be dissolved in the hot water, and then added to the bulk of the water in the spray tank. The oil is first emulsified with an equal quantity of water, and the emulsion is then further diluted with its own bulk of water before adding to the soda solution in the tank.

The formula and method of making the resin-soda spray are given in Spray Leaflet No. 7 which is obtainable free on application to the Department of Agriculture, Box 36A, G.P.O., Sydney.

Case Moths.

(Psychidae.)

DURING the past month case moths have been abundant and reports of damage to the foliage of various trees and shrubs have been received. Case moths derive their popular name from the fact that the larvae or caterpillars construct silken cases within which they hide when not feeding.

The most numerous and widespread species is the leaf case moth (*Hyalarcta huebneri*) which attacks many species of trees and shrubs, including garden plants, and forms silken sacks which eventually may measure up to 2½ inches in length. The cases are covered with pieces of leaves, the particular kind depending upon the species of host plant upon which the caterpillars are feeding.

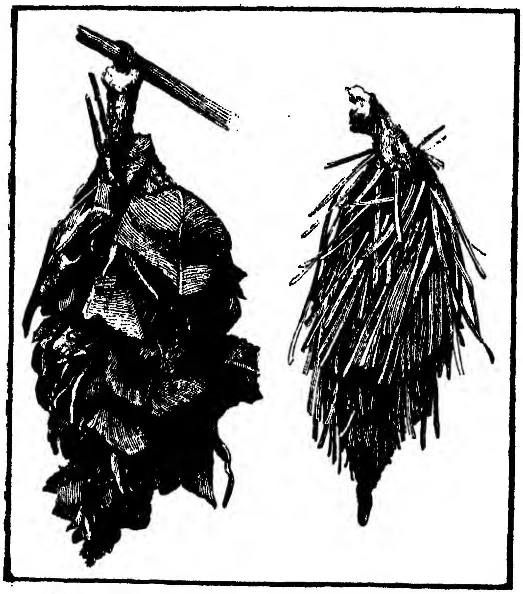
The caterpillar is stout-bodied, with the head and thorax mottled brown, the remainder of its body being somewhat lighter coloured. When moving about or feeding the head and fore-legs of the caterpillar project from the case, which is carried wherever it crawls. When fully-fed the caterpillar fastens the bag by a silken band to some portion of the host plant or adjoining object, closes up the neck of the bag, and within this sack enters its pupal or chrysalis stage.

The adult males are clear-winged, swift-flying, black-bodied moths which emerge from the lower ends of the silken sacks, but the females which are covered with brown hairs are wingless and never leave their cases.

The eggs hatch within the case and the young larvae make their way out and construct minute cases of their own. As the larvae increase in size, they add further silk and pieces of food plant to their protective sacks.

Control.

Where these insects are present in large numbers and are injuring the foliage, they may be controlled by spraying with arsenate of lead, using 1 lb. of arsenate of lead powder in 40 gallons of water (1 oz. to 2½ gal.).



Silken Cases, or Sacks, of the Leaf Case Moth.
Showing food plants used to cover the exteriors.

Hand picking and destruction of the caterpillars within their cases can be carried out where small garden shrubs are infested and numbers are limited.

: : Keep on Buying War Savings Certificates : :

The Milch Goat

As a Source of Milk Supply for Inland and Suburban Areas.*

H. G. BELSCHNER, D.V.Sc., H.D.A., Deputy Chief, Division of Animal Industry.

IT is evident that many people, mainly in inland areas of the State and in the suburbs around Sydney are interested in the use of goats' milk. The principal reason for their interest in goats is the cost and difficulty of feeding and grazing a cow in these areas, while in the suburbs the amount of land available is an important factor. The other reasons for the interest in goats' milk are its high value for feeding infants and children and the comparative freedom of the goat from disease.

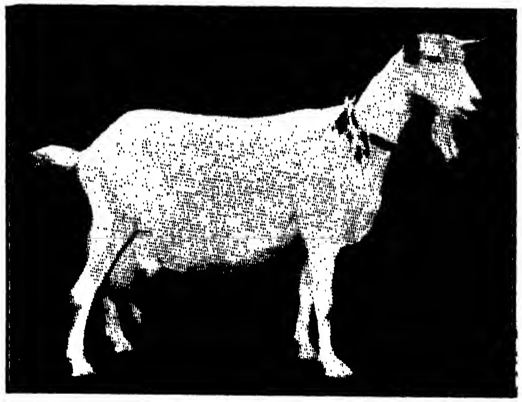
In many countries, the raising of milch goats is a prominent feature of the livestock industry. Taking into account the size of the animal, the amount of food it consumes and the quantity and high quality of the milk produced, this can be readily understood. In this country, however, many people appear to have a quite unwarranted contempt for the goat; it is suggested that this is largely due to lack of knowledge concerning this very valuable little animal. Many people do not realise the degree to which the milking goat has been developed, nor the ample supply of milk which it will provide if properly looked after.

Types of Milch Goats.

Whilst large numbers of goats are to be found throughout inland areas, they are of mixed types and generally inferior as milkers, the admixture of Angora blood having resulted in reduced milk supply. The types and breeds of milk goats commonly seen in Australia are those showing Nubian, Saanen, British Alpine or Toggenburg characteristics.

The Nubian or Oriental types exhibit various colours with no uniform pattern and are lop-eared. They give a rich milk but lack in quantity. The Saanen, Toggenburg and British Alpine are all Alpine types having upright ears giving them an alert, deer-like appearance. The now famous Saanen and Toggenburg goats (both Swiss types) have been specially bred for the abundant production of a high quality milk, which is entirely free from any taint.

The Saanen is pure white or pale biscuit colour and the Toggenburg may be any colour between light fawn and dark chocolate, with white markings on fore legs and along the abdomen. Both types are generally and preferably hornless. The Saanen is by far the more popular breed in Australia.



British Saanen Goat.
[*British Goat Society's Year Book.*

Goats' Milk.

Goats' milk is highly nutritious and, although the flavour is slightly different to that of cows' milk, it is frequently difficult to detect this difference if the goats are properly fed. Goats' milk is alkaline in reaction, whilst cows' milk is acid. All milk undergoes a process of curdling in the stomach; with cows' milk the curd is large, hard and tough, whilst the curd of goats' milk is small, light and flocculent, so that digestion is greatly facilitated. Goats' milk has a high butter fat content—approximately

* Extracted from a broadcast recently given over national stations.

5 per cent. The fat globules are much smaller than in cows' milk and do not rise readily to the top of the milk in a distinct layer, but the fat is readily separated by the ordinary separator.

The butter made from goats' milk is white, though otherwise of the same appearance and taste as butter made from cows' milk and, when artificially coloured, is indistinguishable from it. Goats' milk is also very suitable for making cheese on account of the high percentage of casein it contains, and is used very largely for this purpose in Switzerland.

The value of goats' milk for feeding infants and children is well known and its use is strongly recommended by the medical profession for this purpose. Goats' milk is said to be digested in the human stomach in twenty minutes, this being due to the fine curd and the fact that the small fat globules are easily assimilated. For ordinary use goats' milk can be taken fresh and in its raw state, with every confidence in its purity and high nutritive value. Tuberculosis in the goat is almost unknown, especially in this country, and there is no record in this State of undulant fever being contracted from goats' milk.

Milk Yields.

"How much milk is obtained from a doe?" is a commonly asked question. Exceptional yields have been given by pure-bred Saanen does, some yielding over 3,000 lb. per annum—and a gallon a day is not uncommon. Generally, it may be stated that a stud Saanen doe should give from three to four quarts a day. With grade goats the quantity is less, but should not be under a quart a day.

Apart from breed and quality of the goat, the manner in which she is fed largely influences the milk yield. Regular and proper milking are important factors, both in the quantity of milk and the period over which it is produced.

The period of lactation in the well-bred goat is about seven to ten months, whilst long lactation milkers produce up to two years. Pure Saanen bucks mated with the better type of flock doe greatly increase the milk yield of the first generation and the lactation period is prolonged.

The gestation period averages about five months, but may vary up to a week either way. The young doe may be mated at nine to twelve months, but she must be well fed to keep her growing. Some breeders will not mate until much later, for early mating tends to stunt the growth and will not tend towards heavy milking. The best results are obtained by mating at eighteen months.

Feeding.

It is commonly thought by people inexperienced in goat husbandry that the goat is a scavenger and can be fed on any sort of edible rubbish—sometimes not even edible. By nature, the goat is a browser and prefers leaves and twigs to grass. It, however, readily adapts itself to hand feeding, and grazes well on pasture. The goat has been called a miniature dairy cow and one would not expect a cow, irrespective of how small she was, to produce a good supply of milk if inadequately fed.

A big advantage in goat keeping is that six to eight goats may be kept on the feed required for one cow. Goats like a variety of food, but a properly balanced ration for milk production should be fed at all times. A good milking goat will consume up to 9 lb. of food per day, including roughage. In making up a ration, it should be borne in mind that goats are very partial to all kinds of vegetable garden products. Lucerne hay and chaff may be fed to advantage. Concentrates in the form of oats, bran, maize and linseed meal, etc., should be fed, if high production is desired. Where good grazing is available, mixed concentrates from 1 to 1½ lb. per day should be fed, plus additional concentrates for heavy milkers. As with the dairy cow, individual feeding should be carried out and each doe studied, if the best results are to be obtained. An average milker costs from 2s. 6d. to 3s. a week to feed.

Comparative Freedom from Disease.

The goat is a hardy and very healthy animal. Its comparative freedom from disease in this country, particularly of the diseases which may be transmitted through the milk, make it a very suitable animal for supplying milk to children and invalids.

Internal parasitic infestation—stomach and intestinal worms—is the commonest cause of trouble in the goat. These parasites are, however, comparatively easily treated and their ill-effects are greatly minimised if the goat is well fed. External parasites in the form of lice are controlled

by grooming of the goat and general cleanliness and washing with a reliable sheep dip. Mammitis or inflammation of the udder is much less common in goats than cows and, should it occur, must be dealt with as in the case of a cow.

In general, the goat, when kept under suitable conditions and even on small areas of land, is a clean animal. Although the bucks have rather a strong odour and should be kept away by themselves, the does are entirely odourless. Goats require shelter from wind and rain, but should otherwise not be over-pampered. Sterilised bone meal or calcium carbonate might be made available to them with advantage and they should have access to plenty of fresh water.

The Price of Goats.

When purchasing pure-bred goats, a fair estimate is to allow £1 for every pound of milk produced daily. A gallon milker is therefore worth about £10.

GOAT BREEDING.

C. G. F. GRANT, Herdmaster.

THOSE interested in the breeding of goats will find that, as with cattle, there are many breeds. These may be classified into two groups—milch goats and carcase goats.

Milch goats are, for the most part, short-haired with fine quality skins, and their

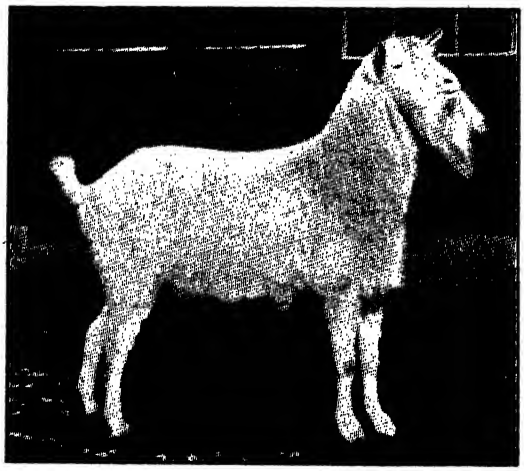


Fig. 1.—Male Saanen Goat.
[*British Goat Society's Year Book.*

colour varies with the breed. Where the colour is white there is a keen demand for the skins of kids for glove manufacture.

Carcase goats are principally white in colour and grow much longer hair. This "mohair," as it is called, if available in sufficient quantity, is in demand for carpet and rug manufacture and for incorporating in bright coloured materials.

The accompanying illustrations (Figs. 1 and 2) show bucks of the milch and carcase types of goats, respectively.

The Points of a Good Goat.

The points of a good milch goat are very well described in the British Goat Society's Year Book, 1938, by H. E. Jeffery. The following illustrations (Figs. 3 and 4) and descriptions (with slight re-arrangement) are taken from his article.

The general conformation of all breeds of goats, bred for milk production, is very similar, and breed characteristics, in which they differ, are, in the main, confined to colour, shape of head and ears, and, in a lesser degree, size, length of leg and coat. Thus the conformation of Toggenburg, Saanen, British Toggenburg, British Saanen and British Alpine goats is identical, and the breeds are differentiated only by colour, pedigree, and the fact that goats of the first two breeds are usually smaller than those of the other three. The Anglo-Nubian has an entirely different head—its characteristic features being a pronounced "Roman" nose and pendulous ears; and it is often longer on the leg than the Swiss breeds. The English goat is preferably horned, smaller, shorter

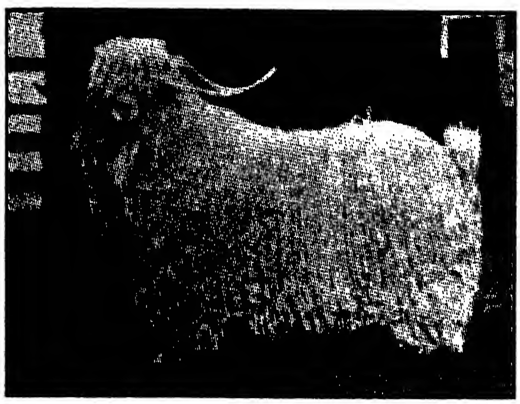


Fig. 2.—Angora Male Goat.
[*British Goat Society's Year Book.*

on the leg, and possesses a longer coat. The British goat has no distinctive type—it has been derived by crossing the above named breeds and may be of any type.

The following notes will be helpful in judging goats of any breed:—

HEAD—

The head should be long and of moderate width, with a full and well-developed muzzle and prominent nostrils.

The facial line should be "dished" (concave) or straight.

The eyes should be large and bright, set well apart, and show both intelligence and docility.

The ears should be of medium length and size, carried pointing forward and above the horizontal.

In an adult goat the eight front teeth carried in the bottom jaw should meet the "pad" of the top jaw.

The head should be free from any form of horny growth, whether the goat is naturally hornless or disbudded.

FORE LEGS—

These should be straight and strong, and possess good bone.

FEET—

A goat should stand well up on its feet, with no tendency to turn its "toes" up and walk on its "heels." The horny growth covering the hoof should be kept trimmed to the "sole" of the foot, leaving the latter bare underneath.

BODY—

Good depth of body is an important feature. From where the stomach joins the chest (a little way behind the fore legs) it should drop in a gentle curve, rising slightly again to meet the udder.

The back should be level from shoulders to hips, and then drop slightly to the tail. The hips are often slightly higher than the shoulders. This latter point is not objected to, but any considerable "dip" in the back is a bad fault. Plenty of length from head to tail is a desirable feature.

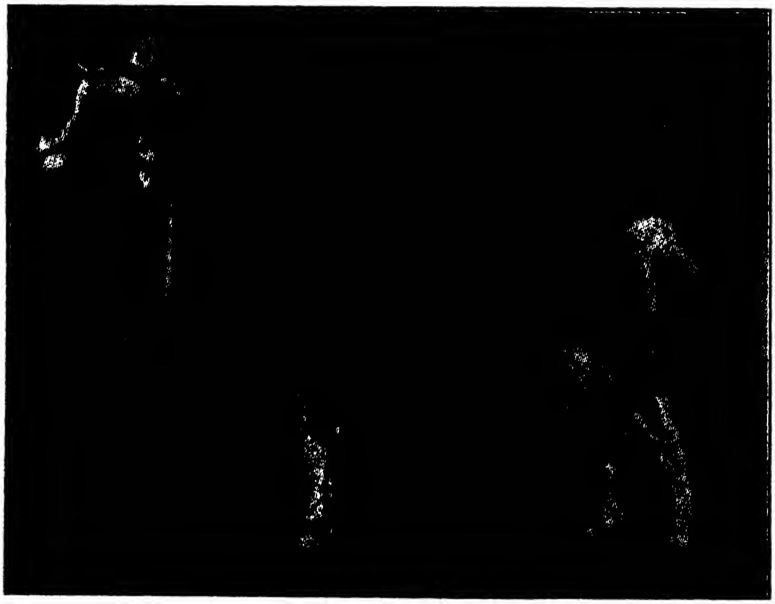


Fig. 3.—The Type of Animal to Aim at when Buying or Breeding Goats.

A British Alpine, but the genera conformation of all milch breeds is very similar.

Above all, the head should be well carried, possess a feminine appearance and that subtle distinction known as "quality."

NECK AND SHOULDERS—

The neck should be long and slim and of good depth. If "tassels" are present (they are of no value) they should be evenly hung.

The withers and shoulders should be fine in appearance and connect the neck with the body with little break in the line.

Any considerable thickness in the shoulders, drop immediately behind the shoulders, or cavity under the shoulder blades, is undesirable.

CHEST—

The chest should be moderately deep, of good width, and give the appearance of strength without coarseness.

OUTLINE—

The photograph from the viewpoint of a person standing immediately behind the goat, illustrates the "wedge" outline desired. Starting with a slender neck, the animal gradually increases in width through the shoulders until the maximum width is reached in the full spring of the ribs.

The other photograph (Fig. 3) illustrates another "wedge" outline that is to be looked for—a wedge starting at the neck and steadily increasing in width to the level of the hips.

RIBS—

These should be well sprung so as to give a "barrel" effect. "Flat sides" are a common fault. The stomach should not protrude beyond the width of the ribs and spoil the rounded appearance.

HIND-QUARTERS—

The view of the hind-quarters from the rear illustrates the width that is desired—width across the hips, across the rump, between the pin bones, and between the hocks. The hind legs should face straight forward and not outwards—the latter tendency, which results in what are known as "cow hocks" (the hocks nearly touching), is one of the commonest failings in goats.

The side view illustrates the slight rise of the back to the hips and the gradual fall of the rump, which should be of good length, to the tail. A sharp drop from the hips to the tail is regarded as a bad fault.

HIND LEGS—

These should possess good bone and give the appearance of strength. The hocks should be slightly bent. The pasterns should be short and the pastern joint should show no sign of weakness, resulting in dropped pasterns.

UDDER AND TEATS—

The udder should be carried well under the body and thus, when viewed from the side, most of the udder should appear in front of the hind leg.

The udder should be large in size but its size should bear some relationship to the size of the goat. The shape of the udder should be similar to that of a globe—with a slice cut off where the udder is joined to the body. The udder should be carried well under the body, to which it should be attached over a large area. A long pendulous udder, an udder that protrudes from the hind-quarters, or an udder that is "split" (has a cavity, in front, between the two halves of the udder), is regarded as faulty. The skin of the udder, which is usually partly covered with fine hair, should be soft and pliable. The texture of the udder should be reasonably soft, although it must be remembered that heavy milk production necessitates the presence of tissue-forming storage cells. In all cases the udder should be much smaller after milking than before milking, and such tissue, and also the milk ducts in the teats, should be entirely free from any hard lumps (sometimes only to be discovered after milking), which indicate congestion which may be due to a variety of causes. The teats, which should point downwards and slightly forwards, should be moderately long and of such a size that they can be comfortably held in the hand for milking purposes. They should be quite distinct from the udder—the type of udder in which it is difficult to say where the udder ends and the teat starts is unsatisfactory. Large milk veins, under the stomach and leading to the udder, while usually more developed in old goats, are an indication of a good milker.

SKIN AND HAIR—

The skin should be soft, supple and loose. The length of coat varies in the different breeds, but generally speaking, it should be fine, short and glossy.

GENERAL—

The importance of size is often over-emphasised. A large goat is better equipped than a small goat to give a large yield and, consequently, other things being equal, a large goat is preferred, but

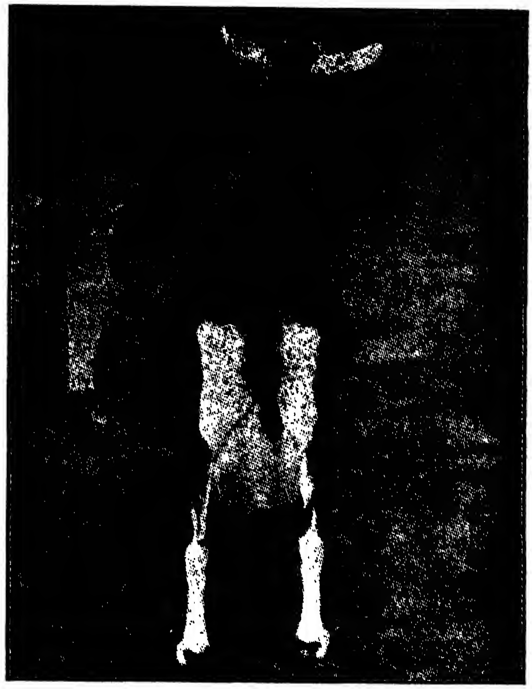


Fig. 4.—The Same Goat Viewed from Immediately Behind.
Showing the desired "wedge" shape.

size is of little value without the other good points required. Taken as a whole, the goat should appear:

(*a*) Active and healthy—indicated by alertness and "bloom."

(*b*) Feminine—with no suggestion of coarseness.

(*c*) Symmetrical and in proportion—good conformation will give this.

Stud Beef Cattle Exhibition.

THE United Stud Beef Cattle Breeders' Association will hold a stud beef cattle exhibition and sale from 10th to 14th April in the Commonwealth Wool and Produce Co.'s. Store, at Pyrmont (Sydney).

Apart from the value of this exhibition in encouraging the maintenance of high standards in the stock industry, the sale will be fulfilling a very important national purpose in distributing high-class stud stock throughout the Commonwealth.

Entries close on 6th March, 1943, with the hon. secretary of the United Stud Beef Cattle Breeders' Association, Box 4317 YY, G.P.O., Sydney, from whom schedules and further information are available.

FEEDS and FEEDING NOTES.

FEEDING PIGS FOR PROFIT.

G. L. McCLYMONT, B.V.Sc., and F. H. W. MORLEY, B.V.Sc., H.D.A., Veterinary Officers; and F. BOSTOCK, Senior Piggery Instructor.

THIS is the first portion of an article on pig feeding intended, in particular, for those men who have recently entered the sphere of pig production. However, all pig producers should find in it much information of value to them.

"There is money in pigs" is a common saying—and a true one—but to prove it on the farm it is necessary for the farmer to know how to feed properly, since feed costs comprise from 65 to 80 per cent. of the total cost of pig production. It will be recognised that efficiency in feed utilisation, that is, the number of pounds of pig meat produced per ton of feed, is the most important factor in determining the profitableness or otherwise of pig farming.

Australian pig farmers have tended to regard the pig as a convenient means of disposing of waste products, yet in other countries, such as Denmark, it is claimed that up to £20 per cow has been made through pigs, by supplementing dairy by-products with a cheap grain such as barley. Cheap grain is available in our wheat areas and can provide the basis of profitable pig production. The correct use of this grain with our dairy by-products could increase our present pig production several times.

However, efficiency in pig production can only be reached if due attention is paid to the following factors:—

1. Layout of the piggery.
2. Organisation and management.
3. Type of breeding stock.
4. Care of stock so as to reduce mortality.
5. Feeds and feeding.

Information and literature on these subjects may be obtained on application to the Department of Agriculture.

Breeding and Feeding Influence Carcase Growth.

Correct feeding can influence such qualities as yield of bacon, back fat thickness, and belly thickness, but for first quality carcases well-bred pigs are necessary. That is not to say that a pig must have a pedigree or must belong to any particular breed.

Some strains of pigs show a high efficiency in food utilisation; others have low efficiency. Recording the details of food consumption and meat production will disclose the profitable and unprofitable strains of pigs. However, no matter how good the breeding, unless feeding is correct it is useless to attempt the production of first-class bacon or pork. *Prime quality pigs are only produced by proper selection of breeding stock, combined with proper feeding of market stock.*

Birth to Bacon—Three Stages of Growth.

Growing pigs are continually changing their body proportions, so that the baconer ready for market is a very differently shaped pig from a weaner. Feeding can influence these changes to produce the proportions of a high class bacon carcase.

Experimental work has shown that some parts of the body develop earlier than others, and that there are three overlapping stages of growth. In the first stage, part of which takes place within the sow, growth of the bony skeleton is the most prominent feature. During the second stage, growth of muscular tissue, that is, the lean part of the carcase, takes place, and following on this stage, there is a greater tendency to lay on fat. Early-maturing pigs go through these stages more rapidly that late-maturing pigs.

Consideration of these factors indicates that to obtain desirable development of the lean part of the carcase, pigs should be heavily fed during the stage in which muscular growth is the most prominent feature, that is, up to the light porker stage. If heavily fed during the later stage of growth, the carcase is likely to be too fat for the best market requirements, and a correspondingly lower price is obtained.

Pork or Bacon.

Pigs required for the pork trade, that is, pigs maturing at 120 lb. live weight, should be heavily fed throughout, to produce the right proportions of fat and lean at this weight. If feeding is too light, the carcases will not be fat enough at 120 lb. live weight.

Bacon carcases should have the correct proportion of fat and lean at 160 to 230 lb. live weight (varying according to home production or export requirements). To attain this it is necessary to feed heavily to 70-80 lb. weights in order to allow sufficient muscle development. The ration may then be restricted slightly so that the carcase does not become too fat. If a bacon pig is underfed early or overfed late, it will produce a carcase with poor eye muscle and heavy back fat—an undesirable type in the trade.

The accompanying illustration indicates the effect on carcase quality of various methods of feeding. Note the "high-low" carcase—a pig fed in the recommended manner and yielding the required type of carcase.

The Constituents of Feeds.

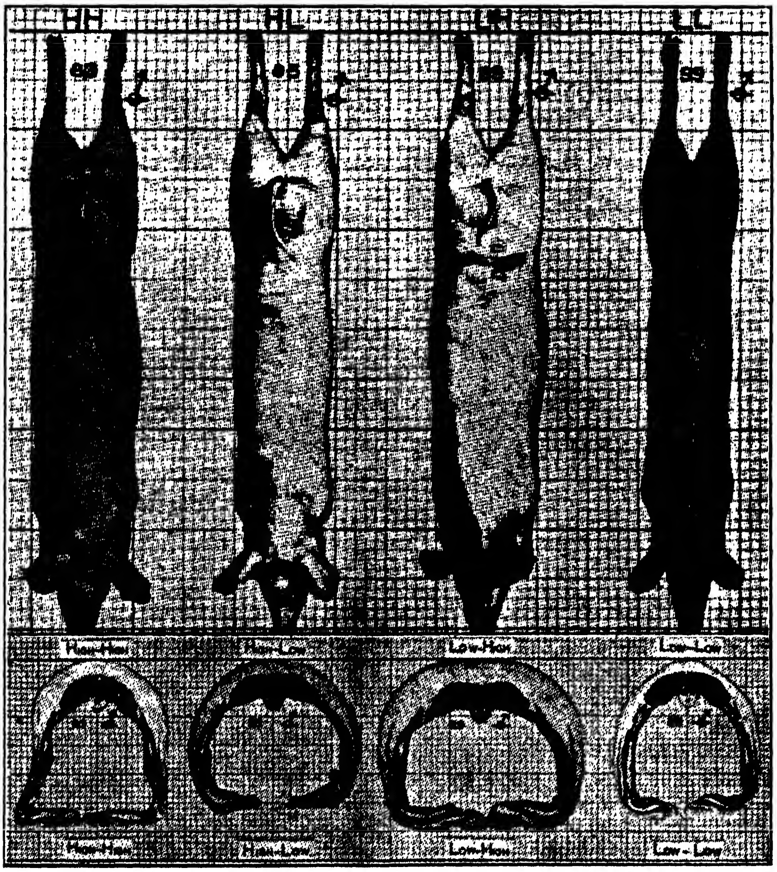
A knowledge of the composition of feeds is essential to successful feeding. To this end the following notes on the constituents of feeds, their functions, and practical importance in rations should be of value.

Protein.—Muscle, *i.e.*, flesh or "lean" is largely protein. Sufficient protein in the ration is therefore necessary for quick growth of a well-fleshed carcase. Insufficient protein prevents quick growth of muscle, especially during the stage of muscle growth, so producing an over-fat, under-fleshed carcase.

Quantity of protein in the ration is therefore important, but quality of protein is of equal, if not greater importance. Protein of animal origin, such as the protein of dairy by-products and meat meals, is of much better quality for growth of pigs than protein of plant origin, such as the proteins of grains, grain by-products and oil meals. The improved growth rates and improved efficiency of conversion of feed which occur when grain is supplemented by comparatively small quantities of skim milk, whey or butter milk, are due to the high quality protein in the supplement.

Whilst adequate protein of good quality is necessary for best growth, protein above this amount will not stimulate growth or lead to the production of leaner carcases. Neither, on the other hand, is excess protein detrimental to growth or carcase quality, as any surplus protein is simply converted to fat.

Fats.—Type of fat in the feed can influence type of fat in the carcase. Accordingly, excess low melting point or soft fat in the feed will produce a carcase with low melting point or soft fat. Such carcases are undesirable on several grounds, such as difficulty in curing, loss of weight during cooking, a tendency to turn rancid and discolour, and unpalatable and unpleasing appearance. If bought on the hook, a soft fat carcase will always be marked down in price.



Carcases showing the Results of Four Methods of Feeding.

[*Photographs reduced to same body-length and "eye muscle" length.*]

High–High.—Heavily fed from birth to bacon; showing over-fat carcase, short side, and wasteful belly-flap—168 days' old.

High–Low.—Heavily fed to porker weight, and then lightly fed to bacon weight; showing well balanced lengthy carcase with correct proportion of fat and lean, and good streak—196 days' old.

Low–High.—Lightly fed to porker weight, then heavily fed to bacon weight; showing over-fat carcase with insufficient lean and wasteful belly-flap—196 days' old.

Low–Low.—Lightly fed to bacon weight; showing results of slow development, insufficient fat, and too much lean—315 days' old.

[*After McMeekan and Hammond.*

Feeds liable to produce such carcases are those with a high proportion of the low melting point vegetable fats, such as peanuts, soya beans and linseed. However, when the meals produced from these oil seeds are used, *i.e.*, meals with an oil content below about 6 per cent., no trouble need be expected if they are fed in the usual small amounts. Fats in the grains are of low melting point, but as they are present in small amounts (1 to 4 per cent.), they have little or no influence on the type of fat in the carcase.

Fat of animal origin such as fat in meat meals, is of comparatively high melting point, and thus does not affect the quality of the carcase fat. Fat produced in the body from carbohydrates is always of high melting point, *i.e.*, the required firm type. If a pig grows slowly, more of its body fat is laid down from fat in the food, which may be of low melting point, instead of from carbohydrates, so that quick growth is necessary for best fat quality.

Carbohydrates. — These materials, such as starches and sugars, which comprise the greater part of grains, are used for heat and energy production, and, after conversion in the body, are the main source of fat in the carcase. "Starchy" rations, *i.e.*, rations high in starch, are sometimes blamed for digestive disorders, but such diagnoses have no basis in theory or practice, as a ratio.ı high in starch is necessary for pigs.

Fibre.—For maximum growth rates and most efficient conversion of feed, pig rations should not contain a high proportion of fibre. Therefore, "bulky" feeds high in fibre, such as chaff, hay, silage, or pasture and, to a lesser extent, oats and bran, should not form too great a part of the ration of growing pigs. Boars and sows, as they are not actively growing, can efficiently handle greater quantities of such bulky feeds. The following figures may be used as rough guides to the fibre contents of the various feeds:—

Fibre Content.

	Per cent.
Grains	2-4
Oats	10
Bran	8
Young pasture (dried)	15
Mature pasture (dried)	25
Hay	25-40

Minerals.—Ground limestone (calcium carbonate) 1 lb. and common salt 1 lb., per 100 lb. feed, is sufficient to cover any possible mineral deficiencies in the usual feeds. This method of supplying calcium is considered preferable to the older system of adding limewater. Slaked lime (calcium hydroxide) may be used in place of ground limestone, but costs somewhat more. However, where dairy by-products constitute the main part of the ration there is very little likelihood of any mineral deficiency, least of all calcium.

Insufficient calcium in the ration may result in small litters, birth of dead pigs, spine weaknesses with consequent hindquarter paralysis and slow growth rates, so that the necessity for supplementing calcium-low feeds such as grain, with a supplement of ground limestone is obvious.

Phosphorus is rarely likely to be deficient, as the usual feeds of grain and protein supplements are rich in this mineral. However, bone meals and di-calcic phosphates are frequently advised, but are not usually necessary, as calcium is more cheaply supplied by ground limestone and the phosphorus is not required. Where pigs are being largely fed by grazing on phosphorus deficient soil, a lick of equal parts bone meal and salt could be provided.

Milk of all animals, and of sows in particular, is extremely deficient in iron. If suckers are confined to hygienic wooden or concrete pens without access to soil, they are liable to suffer from an iron deficiency, as under normal circumstances they supplement their iron intake by eating a certain amount of soil. Thus, where piglets are run under these conditions, *i.e.*, without access to yards, they should have a shovelful of earth placed in the corner of the pen. The iron content of this earth may be increased by pouring an ounce of crude iron sulphate (green vitriol) dissolved in water over the soil.

Anaemia resulting from insufficient iron is evidenced by a poor growth rate, pale eye membranes, and, most marked effect of all, greatly increased susceptibility to such infections as white scours and pneumonia. If anaemia has appeared, the application of a paste of powdered iron sulphate, water and treacle to the teats of the sows may be tried.

Charcoal, sulphur and various drugs as gentian, aniseed and fenugreek, are occasionally advised for inclusion in licks for pigs, but there is no evidence to indicate that pigs derive any benefit from their use.

Vitamins.—If the usual feeds are supplemented with a daily green feed allowance, there is little risk of any vitamin deficiencies. However, where green feed is not available, Vitamin A deficiency is likely, leading to nervous disorders such as convulsions, paralysis and staggers, decreased growth rate and marked susceptibility to infections such as "scours" and pneumonia. Fortunately, however, if pigs are fed on a rich source of this vitamin, such as young pasture or crops, they can store up sufficient to tide them over a considerable period without the vitamin in their diet, so that if green feed is unavailable for a short time there is no cause for concern.

Yellow maize is a fair source of Vitamin A, but green feed should not be restricted when feeding maize, because of the deficiency in maize of other vitamins which are supplied by green feed. If during prolonged dry spells green feed or a substitute such as lucerne meal, is not available, ½ per cent. of good quality fish liver oil in the ration will supply sufficient Vitamin A.

Care should always be taken that the diet of pregnant and lactating sows contains a source of Vitamin A, as the suckers are entirely dependant on their mother's milk supply for this vitamin.

Vitamin D, the rickets-preventing vitamin, is formed in the body by the action of sunlight, so that under Australian conditions of pig raising there is little risk of deficiency of this vitamin.

Other vitamins of the B group which are necessary for pigs may be deficient in some rations, but a daily supplement of good green feed will cover all these possibilities.

Feeds for Pigs.

Grains.

Wheat, barley, maize, grain sorghums and millet are all very satisfactory feeds for pigs, and are of approximately equal food value. Maize has been reported as causing soft pork, but the effect, if any, appears to be of little importance if the maize is fed in a balanced ration. Oats are not a usual feed for pigs, being too fibrous, but if finely ground, may form up to half the ration of growing pigs, and a larger part of the ration of brood sows or boars. It should be remembered that if used to any extent in pig feeds oats tend to decrease the digestibility of other foods.

Rye is a satisfactory food for pigs, but if forming over half the ration is too unpalatable. Rice, if ground, is a satisfactory food, and, unlike the rice by-products which contain a high proportion of fat, produces firm carcases.

By-products.

Wheat pollard has almost equal value to grains, but contains more fibre, and is sometimes used, when price permits, to replace portion of the grain ration.

Wheat bran is too fibrous to be a satisfactory food for fattening pigs. It is useful, however, as a laxative feed for brood sows at farrowing.

Rice bran and rice pollard tend to produce soft pork but may be suitable if not forming over half the ration.

High fibre content renders brewers grains unsuitable for pigs, although they may form part of the ration for brood sows. In Britain, substitution of 15 per cent. of the ration by brewers grains has given satisfactory results, especially for pigs over 80 lb.

Although there is no experimental evidence as yet on the value of the distillery by-product from production of power alcohol from wheat, its value should be approximately similar to that of brewers' grains.

Root Crops.

Turnips, potatoes, pumpkins, mangolds, artichokes and arrowroot contain a high proportion of water, the dry portion being nearly equal in food value to grain. Root crops, since they contain a low proportion of protein, require supplementing with protein concentrates. Pigs fatten quite well on root crops if given skim milk or meat meal.

Reports from New Zealand indicate that mangolds may cause poisoning in pigs. However, if stored for a period before feeding no trouble should be experienced.

Pumpkins are of similar value to root crops and are a very good source of Vitamin A.

Information on growing these crops may be obtained on application to the Department of Agriculture.

Protein Concentrates.

Dairy By-products.—Skim milk and butter milk are very high class protein supplements for grain, and are a rich source of minerals and vitamins. They may be fed to pigs alone, but the return per gallon becomes greater as the proportion of grain is increased. By supplementing grain rations with as little as ½ pint of separated milk, marked increase in growth rates have been obtained. When fed alone, 6 lb. skim milk or undiluted butter milk, has a value equal to about 1 lb. of grain. As a protein supplement, ½ gallon of skim milk is equivalent to about one-third lb. meat meal containing 55 to 60 per cent. protein. Half to ¾ gallon of skim milk will satisfy the protein requirement of pigs of any age.

Generally speaking, 1¼ gallons of whey are equivalent to 1 lb. grain, so that whey has approximately half the food value of skim and butter milk. Although whey only has one-fifth of the protein of skim and butter milk, it is, nevertheless, an excellent supplement to grain, as the small portion of protein is of excellent quality.

Litter Sisters, Kept and Fed under Identical Conditions After Reaching 200 lb., Now Pregnant for the Second Time.

Left.—Grown to 200 lb. on a high-low plane of nutrition. *Right.*—Growth to 200 lb. on a low-high plane.

[*After McMeekan and Hammond.*

Where whey is being fed alone, pigs will consume an extremely large quantity, sows even dealing with up to 15 gallons daily. It is important to avoid sudden changes in diet, and to feed up to four times daily, if possible, if digestive disturbances are to be avoided. Best results should be obtained when whey is used in combination with grain, or grain and meat meal.

South Australian experiments have shown that, as a supplement to grain, 10 per cent. of dried whey was slightly superior to 8 per cent. meat meal. When whey and meat meal were combined in the ration even better results were obtained. It is therefore considered advisable to use meat meal with whey, ¼ lb. per pig per day being sufficient.

At present a large proportion of dairy by-products is wasted; in fact, expense is incurred in disposing of them. It is suggested that, if inconvenient to feed these direct to pigs, a good market for dried or partially dried products should exist in wheat areas, where they would form a valuable supplement for feeding with grain if obtainable at a suitable price.

Pigs fed with dairy by-products from cows affected with tuberculosis will contract this disease. In some districts up to 3 per cent. of carcases have been totally condemned because of tuberculosis. Therefore, if the by-products are not from tubercle-free herds they should be boiled or pasteurised.

Lactic acid formed from milk sugar may corrode concrete and iron piping or troughs. Even galvanised iron is not completely resistant, and the zinc dissolved off the iron may cause poisoning in the pigs. Where dairy products are being fed, it is therefore, essential to keep all troughs and utensils clean. Earthenware troughing is probably the most resistant material available.

(To be continued.)

Current Feeding Costs.

AGAIN there has been little change in the cost of feeds, and roughages (hays and chaffs) are still dearer than concentrates as sources of feedstuff. Current costs of the common feeds are quoted hereunder:—

Feed	Starch Unit value per 100 lb.	Protein Unit Value per 100 lb.	Cost.	Cost per Starch Unit.	Cost per Protein Unit.	Comments.
Lucerne hay or chaff (good sound).	35–45 (Average quality 40).	10	£7 per ton*	1·9d.	...	Chaffs still dearer than grains as sources of food matter so that minimum amounts of chaffs should be fed to cattle and horses and a maximum amount of grains used.
Oaten chaff (good sound).	40	3	£6 10s. per ton* ...	1·7d.		
Wheaten chaff (good sound).	40	3	£7 10s. ton*	1·9d.		
Oats	62	8	2s. 4d.–3s. per bushel ...	1·1d.–1·4d.	...	Oats slightly dearer than wheat and barley.
Crushed oats ...	62	8	3s. 8d. per 40 lb. ...	1·6d.–1·8d.		
Maize	78	8	8s. per bushel	2·2d.	...	Maize and maize meal are expensive foods and supplies short.
Maize meal	78	8	£14 per short ton† ...	2·1d.		
Wheat	72	8	3s. 4d.–3s. 8d. per bushel	0·9d.–1·0d.	...	Wheat the cheapest feed and ample supplies available.
Wheat meal ...	72	8	£7 per short ton† ...	1·2d.		
Barley	71	7	3s. per bushel	1d.	...	Barley practically as cheap as wheat.
Barley meal ...	71	7	£7 per short ton† ...	1·2d.		

* Long ton = 2,240 lb. † Short ton = 2,000 lb.

Varieties of Approved Seed Available.

IN order that farmers may be directed to what are regarded by the Department as the most satisfactory local sources of approved seed of recommended commercial varieties of farm crops and vegetables, the Department is willing to supply information concerning such sources of seed of the following varieties:—

Wheat—

Bencubbin, Koala, Eureka 1, Eureka 2, Gular, Bungulla.

Oats.—

Belar, Fulghum.

Onions—

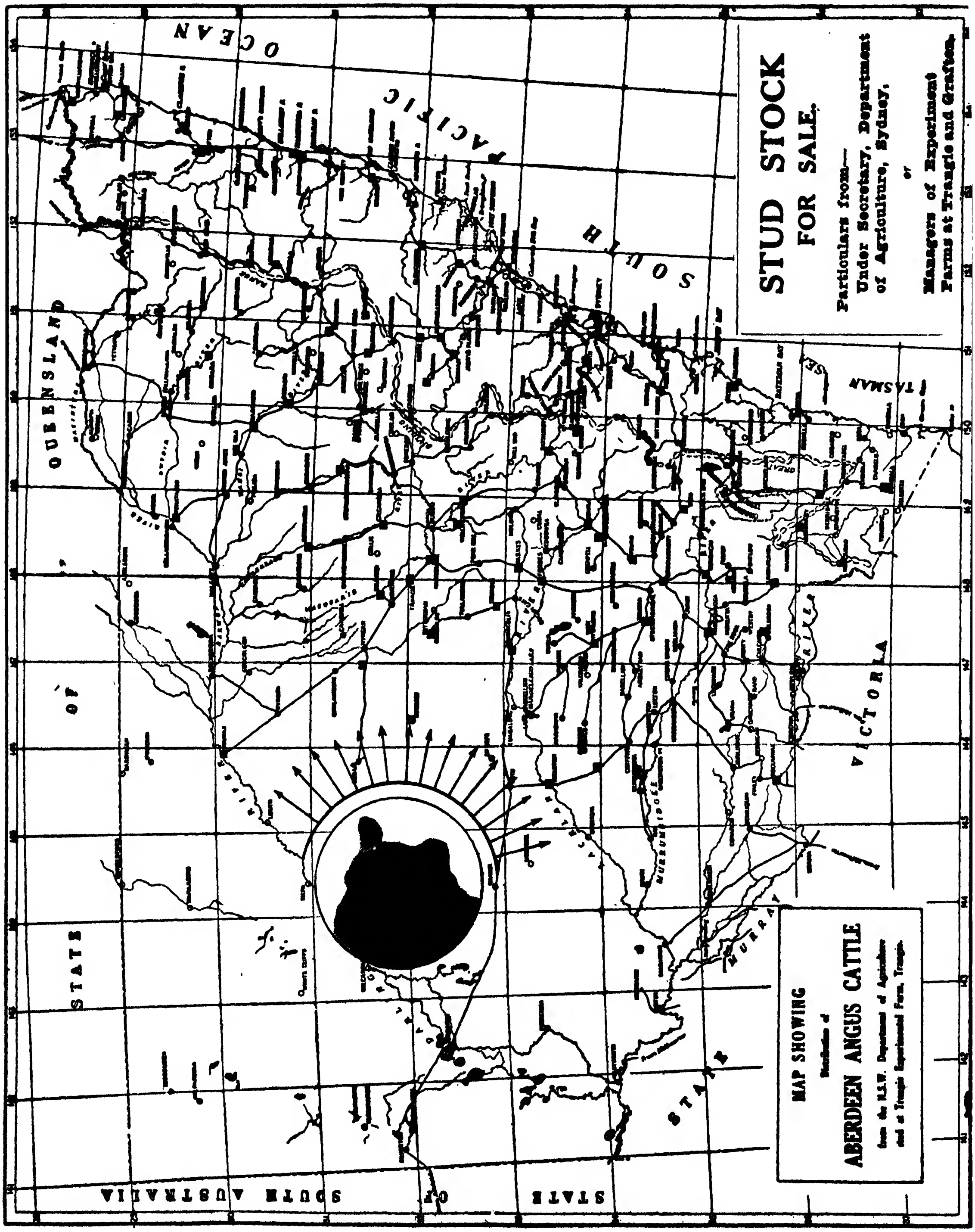
Hunter River White and Hunter River Brown.

Grasses, etc.—

Phalaris tuberosa, Subterranean Clover (mid-season), Sheep's Burnet, Lucerne.

PRIMARY PRODUCERS' ASSOCIATIONS—*continued from page 105.*

Australia, only on the recommendation of the Director-General of Agriculture, since he is responsible for determining the policy of agricultural production in Australia. Furthermore, that in any contemplated recommendation by the Director-General of Agriculture to the Prices Commissioner concerning fixation of the maximum open market price of agricultural primary products in New South Wales, the Director-General of Agriculture obtain the opinion of the New South Wales Council of Primary Producers' Associations."


STUD STOCK
FOR SALE.
Particulars from—
Under Secretary, Department of Agriculture, Sydney,
or
Managers of Experiment Farms at Trangie and Grafton.
MAP SHOWING
ABERDEEN ANGUS CATTLE
QUEENSLAND
STATE OF
SOUTH PACIFIC OCEAN
TASMAN SEA
STATE OF VICTORIA
MURRAY
MURRUMBIDGEE
STATE OF SOUTH AUSTRALIA

Cattle Tick Board of Enquiry Recommendations.

Action by the Minister.

THE Minister for Agriculture, the Hon. W. F. Dunn, M.L.A., has given careful consideration to the report submitted by the Board of Enquiry into certain matters in connection with the tick eradication campaign undertaken in the Grafton-Maclean area.

The Department is in a position to put certain of these recommendations into operation at once, and necessary action will be taken in that direction. Some of the recommendations require fuller consideration, as their adoption means a variation of departmental policy and an increase in the staff in various directions.

The Minister has, however, decided to accept the recommendation regarding the payment of compensation for animals which were dipped or sprayed, and which die within three days of such treatment, but the attention of stockowners is drawn to the necessity for immediately reporting sickness and death associated with dipping or spraying. An endeavour will be made to secure final determinations on the cause of death more rapidly than has been the case in the past, but as this involves the appointment of additional staff, or the securing of certain instruments which are difficult to get at the present time, it may not be possible to accelerate this work immediately.

The Minister has decided to consult the Board of Tick Control regarding the question of discretion allowed to inspectors when asked to spray certain animals in lieu of dipping.

The Minister particularly desires to draw the attention of those farmers who have regularly dipped their herds for thirty consecutive dippings to the recommendation of the Board that they should be urged to continue dipping for the next four months in order to minimise the possibility of an unsatisfactory termination to the work they have already undertaken. In making this recommendation the Board of Enquiry was no doubt influenced by the fact that the period of simultaneous dipping of all herds in this case would otherwise be considerably shorter than it is felt to be desirable in order to ensure eradication of the tick. The stockowners concerned will have realised that the risk of damage to their stock is far less now that the animals have been accustomed to the process than it was at the commencement of the campaign.

Owing to the fact that the original campaign suffered such interruption, it is necessary for precautionary measures to be taken to offset the extra risk which was obviously involved when these interruptions occurred. Particular attention must be given to protecting those stockowners who have regularly dipped their stock up to the present. It is obvious that the greatest risk to them would occur from the introduction of cattle on to their farms from outside; therefore it will be necessary for stock which are to be taken on to such farms from outside sources to be dipped twice at an interval of between five to ten days unless they are coming from a farm which at the time is undergoing regular dipping, in which case one additional dipping will be sufficient. This applies to any farmer who ceases dipping at the present time.

In order to prevent the possibility of tick being conveyed from roads on to farms it will be necessary that all horses working on the roads should now be registered and subjected to treatment every fourteen days until dipping in the area ceases. This would be required, no matter from what holding or establishment the horses come. It is realised that the amount of dipping which has taken place must have very markedly reduced the tick population on the roads, but it cannot be assured, in view of the fact that dipping was not continuous in all cases, that such infestation does not exist. In connection with this matter also, it is understood that cattle from certain farms do frequent or use the roads to some extent, and naturally it would be necessary in such cases to insist on treatment of these herds for the ensuing four months. For the same reason it will be necessary that all stock being moved by road should be dipped at least once during or at the end of the journey, in order effectively to prevent any spread of tick by this means.

In those cases in which farmers who have now completed thirty dippings do not continue dipping as indicated before, it will be necessary that inspection should be carried out every fourteen days for the next four months, and subsequently every twenty-one days whilst dipping continues in the area. If, however, a stockowner prefers to dip his stock in lieu of inspection, such action will not only be permitted, but is considered to be advisable in the interest of the farmer himself.

If isolated outbreaks of tick are found on holdings on which dipping is not proceeding, it will of course be necessary to deal with such farms on an individual basis, and to require twelve months subsequent dipping. The treatment of farms adjoining such holdings would depend on circumstances. It may be necessary to treat them, and it will certainly be necessary to inspect them regularly.

The adoption of these measures will, it is felt, go far to remedy any defects in the work already carried out, and the Minister expresses the hope that all stockowners in the area will now co-operate fully in the work, particularly as the Board of Enquiry has recommended without reservation that the eradication campaign should continue. The measures proposed have been fully discussed with the Board of Tick Control, and that body has indicated that it is in agreement with these suggestions.

THE WINTERING OF BEES.

W. A. GOODACRE, Senior Apiary Instructor.

WHILE the wintering of bees in New South Wales is carried out in a uniform manner, so far as the preparation of the bees, hives, and stores is concerned, a variety in climatic conditions has to be contended with. This uniformity in preparation is possible because we have no extremely cold climates such as are found in some other countries, where in many cases special winter packing of bees is necessary.

In New South Wales we have the areas of warm climate, such as the coastal areas and some inland places, where the bees are fairly active during the whole of the winter, and again we have cool districts, where brood rearing is practically cut out during the cold months, and the bees go into a restful, quiescent, or semi-hibernating state. To the close observer, a comparison of these wintering conditions results in some interesting information. In the warm districts, the bees, being active during the winter, find it

A Hive Prepared for Winter—Full Depth and Two Bolton Supers.

necessary to rear a fair quantity of brood to make up, in young bees, the loss sustained by the field bees from expended energy—the length of life of the bee being governed to a large extent by the energy put into its work. In the general run of seasons, however, the flora is not sufficient for stimulating conditions in the hive during winter, and consequently a fair amount of foraging is done for a small return in the way of stores. As a result the brood rearing which is carried on generally does not make up fully for the loss on field bees, and the colonies in these warm districts are weakened to some extent for the commencement of their early spring work.

The Same Hive During a Honey Flow.

In the areas of cool climate, where brood rearing is practically given up altogether during the winter and the colony enters into a quiescent state for about three months, strict conservation of vitality of the worker bees occurs, and the queen, too, no doubt is benefited by the spell from egg-laying. Under these conditions the colony is enabled to come through the winter with small loss of vitality or of population. It appears evident, therefore, that for just the winter period a cool climate is preferable.

There are other matters, however, which assist in the balance of these conditions. In the warm districts a more settled condition of the weather obtains generally during the early spring, and the colonies, although

somewhat weakened by winter activity, are enabled to build up rapidly. In the cool climates, more or less unsettled weather prevails during the early spring, the result being that brood rearing is retarded, and the colony does not make such headway.

Where two combs well clustered with bees may be sufficient during the early spring in a warm climate, a larger cluster is necessary in the cool parts. It will be seen, therefore, that in the cooler districts better wintering conditions are necessary. If we could get a cool district to winter the bees in, and a warm one to bring them to during the early spring, we would probably come near the ideal conditions. A definite move to put this plan into effect is being made by migratory beekeepers in transporting their hives from inland to coastal districts during early spring.

Comfortable Conditions in the Hive.

The essential points in good wintering of bees are an ample supply of good food, a good cluster of young, vigorous bees, with a young queen bee of a strain selected for wintering qualifications in company, and a good sound hive allowing of comfort for the colony.

A colony of bees will not be comfortable in a hive much too large for the cluster they form; therefore in the final preparation, surplus supers—those above the requirements of the winter cluster and accommodation of the food supply—should be removed.

Many beekeepers, where conditions are not unusually cold, winter their stocks in hives, three full-depth stories high, the same as used for a honey flow in summer. However, even in these warmer districts, damp and cold changes are experienced, and in a hive so large the average colony would have difficulty in providing the best care for its combs of honey, particularly above the second story. These valuable stores above would be likely to deteriorate, absorbing moisture, and providing a breeding ground for yeasts. This yeast development (fermentation) is liable to result in dwindling losses of adult bees when the food supply is to be cleaned up during the following spring.

It is considered that the average colony would be more comfortable during winter, under New South Wales climatic conditions generally, in a hive about equal in size to two stories, full depth, the lower story (brood chamber) having its supply of honey, and the full depth super (or two shallows or Boltons as the case may be) being well stocked with food. With the food so handy to the bees, clustered mostly in the brood chamber, it would be convenient and consequently well cared for. To expect the colony to go higher up to provide the attention the food supply demands is certainly taking a risk, and with the space above the cluster would not be real cosy.

It might be all right to winter in the large hives four years out of five in our mild climate, but it is very trying to get a setback, and perhaps suffer heavy losses, in the season when that special bud prospect is offering on the flora.

The Food Supply.

A colony with a good supply will breed up best during the following spring and require less attention.

Natural stores gathered during a reasonably dry autumn and most of it sealed in the combs before winter, would be classed good quality stores. Bees winter best on darker honey, and the autumn flora usually provides the right class. Good quality stores may be gained, too, from feeding sugar syrup.

Reduce the Size of the Entrance.

To allow of further comfort in the hive, the entrance should be reduced to ⅜ inch in depth, for less ventilation is necessary during winter, and with this sized entrance mice are excluded.

The hive should be sound and waterproof, and its walls of sufficient thickness, in cold districts particularly, to allow of the bees conserving to the best advantage the heat generated by their cluster. It takes food and energy to produce heat.

Moving Bees to Winter Sites.

A number of beekeepers of the inland districts have special sites to which they move their apiaries for wintering. These selected spots offer greater shelter for the colonies and warmer conditions, and as a result earlier progress in building up during the following spring is evident. On the coast quite a number move all of their colonies fairly close to the seaside, where the sandy soil provides an abundant growth of

heath flora. The heath, with its various species of stunted tea-tree and shrub plants, provides a stimulant, very often right through the winter, sufficient to encourage brood rearing fairly freely, and the sandy soil radiates heat to make the site a warm one. Even if it is not intended to move bees close to the seaside every season, it would be worth while testing sites so that they would be available for an occasional move following adverse autumn conditions at home.

Official Recordings of the Department's Herds.

273 Days' recording completed during January, 1943.

Cow.	Sire.	Owner.	Age at beginning of test.		Milk.	Average test.	Butter fat.
			yrs.	mths.	lb.	per cent.	lb.
		Australian Illawarra Shorthorn.					
Junior 3 years—							
Greyleigh Duchess 27th ...	Greyleigh Burlesque ...	Grafton Experiment Farm...	3	3	8,353½	3·7	305·29
		Guernsey.					
Mature Cow—							
Wollongbar Portia 4th ...	Homestead Vulcan ...	Wollongbar Experiment Farm.	6	9	7,884	5·4	425·33
Junior 3 years—							
Wollongbar Tribute ...	May Rose's Laddie 3rd of the Masse.	" " ...	3	1	6,149½	4·7	291·50
		Jersey.					
Mature Cows—							
Richmond Springsong ...	Richmond Nemesis ...	Hawkesbury Agricultural College.	7	0	8,241	5·2	427·49
Wagga Rosalind	Wagga Bella's Echo 2nd ...	Wagga Experiment Farm...	5	10	7,899	5·4	425·32
Yanco Winsome 7th ...	Ellerdale Wonderful Hallmark.	Riverina Welfare Farm ...	6	9	6,928½	5·6	387·77
Wagga Truda	Richmond Gladys' Heir ...	Wagga Experiment Farm...	6	10	6,433½	5·4	*346·35
Yanco Winsome 5th ...	Ellerdale Wonderful Hallmark.	Riverina Welfare Farm ...	7	0	5,478	5·2	†286·10
Richmond Lucille 2nd ...	Richmond Nemesis ...	Hawkesbury Agricultural College.	5	0	5,880	4·3	‡251·19
Junior 4 years—							
Richmond Pendant ...	Right Cute (Imp.) ...	" " ...	4	0	7,745½	5·8	451·73
Senior 3 years—							
Yanco Minnie 25th	Belgonia Gem's Ruler ...	Riverina Welfare Farm ...	3	9	6,532½	4·5	295·52
Yanco Satin Bird 16th ...	Ellerdale Wonderful Hallmark.	" " ...	3	11	5,278½	5·0	263·74
Senior 2 years—							
Yanco Satin Bird 17th ...	Belgonia Gem's Ruler ...	" " ...	2	10	4,482	5·4	†242·09
Junior 2 years—							
Richmond Faith 4th ...	Right Cute (Imp.)	Hawkesbury Agricultural College.	2	3	5,178	6·3	325·62

* Denotes completed in November. † Denotes completed in December. ‡ Denotes recorded 240 days only.

Dutch Farmers Pay for Germany's Fat Shortage.

A SIGNIFICANT commentary on the serious fat situation comes from Holland, where the German authorities, in continuation of their looting policy, have devised a new system enabling them to rob the Netherlands people of at least an extra 40,000,000 lb. of fat almost immediately, as well as to double the amount of fat the Netherlands are annually producing under compulsion for Germany's needs.

The facts of the position can be gathered from the Dutch wireless announcement that 187,000 acres of pasture-land must be ploughed up in order to increase the cultivation of rape-seed under a plan which makes rape-seed growing compulsory. This forced ploughing of such a large area of valuable pasture-land will mean that at least another 100,000 young cattle must be slaughtered, which will provide the Germans with about 40,000,000 lb. of meat and fat.

The cultivation on this land of rape-seed, from which of course rape-seed oil is crushed, will give the Germans, theoretically at least, about 58,000,000 lb. of fat compared with the 25,000,000 lb. produced by cattle raised on the grazing lands to be ploughed up. Rape-seed growing, even if successful, must be disastrous for the future of Dutch dairy farming, since it will take it from two to five years to restore the ploughed land to proper pasture-land.

Fig. 1.—A Good Brooder House is Essential.

Poultry Notes.

March, 1943.

E. HADLINGTON, Poultry Expert.

The Hot-water Circulating System of Brooding.

THE successful rearing of chickens is one of the most vital factors in poultry farming, for upon the results of the rearing season depends largely whether or not a profitable flock of pullets is raised. Any set-back which the chickens receive, especially during the brooding stage, will be reflected in their subsequent development, and too much trouble cannot be taken to ensure that the chickens are raised under the most satisfactory conditions possible.

The first essential is a reliable brooder which will generate sufficient warmth in the coldest weather to prevent the chickens packing together to get warm, and at the same time provide for ample fresh air. It is important also that the brooder should be so constructed that the chickens can move away from the heat if the temperature is too high, and get back again without any obstruction.

Much of the wastage of chicken life could be avoided if sufficient consideration were given to these main factors in brooding.

In cases where the amount of money available is strictly limited it is better to concentrate on providing good brooding equipment and economise on the accommodation for layers, rather than adopt makeshift appliances for rearing the chickens, which is so often done, causing heavy losses and poor development of the young stock.

Many types of brooders are in use on poultry farms, but for the average commercial farm running 600 layers or over, there is none more suitable than the hot water circulating system. One of its main advantages is that it enables the chickens to be kept in small batches in separate compartments, thus avoiding the crowding which frequently occurs where large numbers are run in one big brooder. On the other hand if it is desired to put through larger batches at one time, these can be divided up into the required number of compartments. There are several satisfactory types of brooders and hovers which can be installed for heating by hot water pipes, and it is largely a matter of choice as to which is adopted, but for all types a shed of approximately the same width and height is desirable, the length, of course, depending upon the number of brooders to be installed. It will be found that one brooder unit of 4 feet x 2 feet will be required for each 125 to 150 chickens to be reared during the season, which means that for 1,000 chickens, seven to eight brooders would be necessary according to to the length of the season.

Construction of the Shed.

The shed should be not less than 14 feet wide, 7 feet high at the back and 9 feet high in front, but a foot or two wider would be an advantage.

No matter which type of brooder is installed, a passage 3 feet 6 inches wide should be allowed between the back wall of the shed and the brooders, with a door 3 feet wide at each end to facilitate working.

The length of the inside runs will be governed by the class of brooder decided upon. The width will vary according to the length of the brooder or hover, but 4 feet wide is about the most suitable size and allows a fair-sized run which is essential when the chickens have to be kept confined in bad weather. The height of the run should be at least 4 feet, otherwise the chickens will fly over the fences by the time they are 6 weeks old.

A suitable size for the outside runs is 20 feet long, about 5 feet wide, and at least 4 feet 6 inches high.

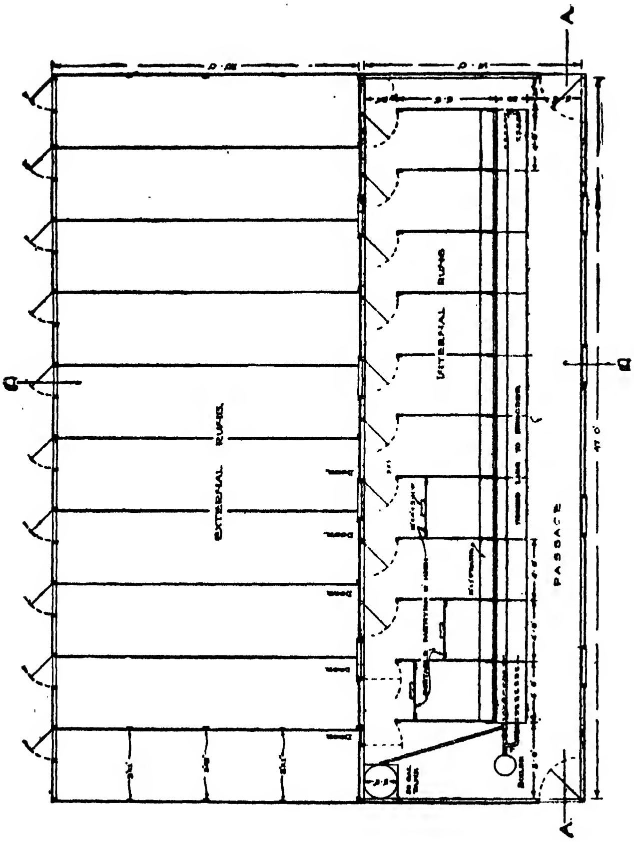


Fig. 2.—Ground Plan.

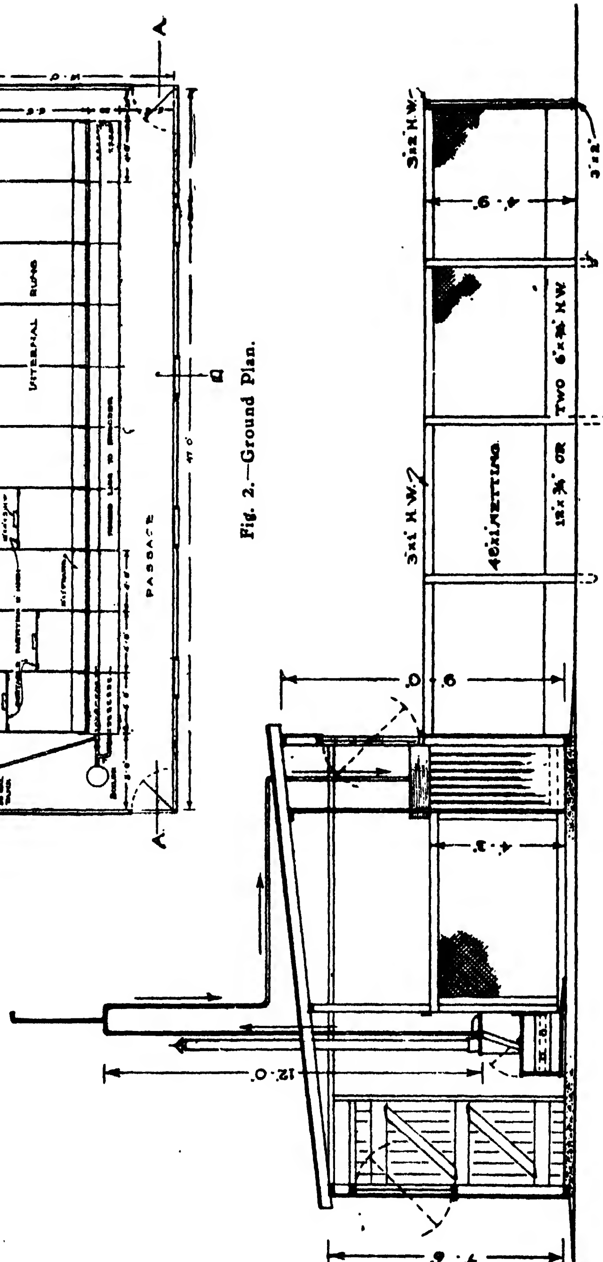


Fig. 3.—Section BB of Plan of Brooder House given in Fig. 2.

Diagrams showing Construction of Brooder House and Outside Runs.

Probably the cheapest and most suitable material for covering the walls of the shed is sawn hardwood palings, with weatherboards above the height of the top plates at the ends, and from the window sills to the roof in front, but, if desired, rustic weatherboards, fibro cement sheets, or bricks can be used instead of palings. The main advantage in using palings, however, is that less studding is required than for weatherboards or fibro cement.

In building the shed, provision should be made for windows both back and front, spaced not more than 10 feet apart. Swing sashes of a stock size, 3 feet by 2 feet 3 inches are suitable for the purpose, and these should be pivoted at the ends so that the length of the window runs the same way as the length of the building. They should be placed as high as possible in the back wall and not less than 5 feet high in the front. The reason for this is twofold; first, it prevents the wind from blowing directly into the brooders when the windows are open; and, second, it does not allow much sun to shine on to the inside runs. If the sun is permitted to shine on to the pens the chickens will congregate in the rays and this sometimes leads to their becoming chilled, and often results in the development of cannibalism.

On no account should an open-fronted brooder house be built for this system, or for that matter for any heated type of brooders, as it is difficult to maintain the correct temperatures in cold weather, and in wet weather there is always a possibility of the floor becoming wet.

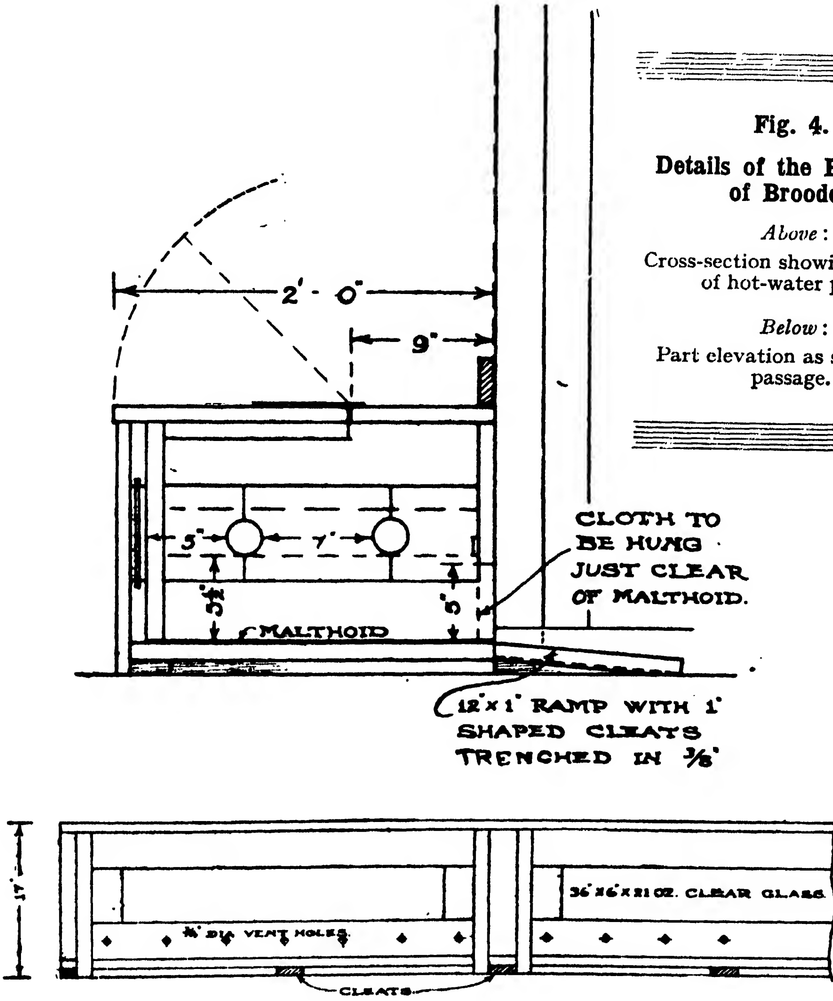


Fig. 4.

Details of the Box Type of Brooder.

Above: Cross-section showing position of hot-water pipes.

Below: Part elevation as seen from passage.

If the brooder house is enclosed on all sides and fitted with the necessary windows for adequate light and ventilation, the chickens can be kept comfortable in all weathers, and this relieves anxiety, particularly during windy and rainy weather.

The Floor.

The most satisfactory floor for a brooder house is a concrete one, as it can easily be kept in a

clean and hygienic condition; also if properly laid it is the most durable.

To make a suitable floor the foundation should be levelled so as to ensure an even thickness of concrete throughout. The surface should then be thoroughly wetted, and a mixture of 1 part cement, 3 parts sand and 5 parts metal screenings laid to a depth of 3 inches, the top being rendered to ⅜ inch deep with 1 part cement to 2 parts sand. It is advisable to complete the rendering on the day that the underneath concrete is put down, and if the whole area cannot be finished in one day, the best course is to finish off a section at a time. In any case joints should be made about 8 feet apart, running across the width of the floor, to lessen the tendency to crack. To hold the floor plates in position, anchor bolts should be fixed in the concrete 5 to 6 feet apart.

Types of Brooders.

Three different types of brooders and hovers are illustrated and described in these notes: the original "box" design, the simple "hover," and the "improved hover" type. The last-mentioned is a compromise between the "box" and "hover" systems, and requires less judgment to operate than in the case of the box.

The diagrams shown in Figs. 2, 3 and 4 relate to the box type of brooder, but the hover types can be substituted where desired, though in that case the layout of the interior of the brooder house would have to be altered somewhat to suit.

The Improved Type of Hover Brooder.

The latest type of hover brooder shown in Figs. 5 and 6 has advantages compared with the "box" and "ordinary hover" types, and has proved very satisfactory on both Government and private farms.

The chief of these is that, having curtains on both sides and an enclosed compartment at the back, the chickens can move out on both sides to a cooler place when too warm, and thus there is not the same necessity to regulate the temperature as in the box brooders, in which the lids require to be lifted to vary both temperature and ventilation.

Another benefit of this hover is that it is separated from the main run by a dividing fence, which prevents the chickens from flying on top, and cleaning out can be done from the passage along the back of the brooders by folding back a wire frame and lifting up the top of the hover. The young chickens when first put in can be kept confined to the small area on one side of the hover where they can be fed and watered.

When the warmer weather commences and it is desired to reduce the temperature in the hovers where the older chickens are, a wedge can be placed under the lid to allow more ventilation or one curtain can be removed. The low wall at the passage along the back is shown in the illustration (Fig. 6) to be movable, but the construction can be simplified if desired by making it fixed. In either case, provision can be made for placing the water vessels on the outside by making a grille for the chickens to drink through, but, of course, it would be necessary to have another water vessel for the small chickens for the first few days.

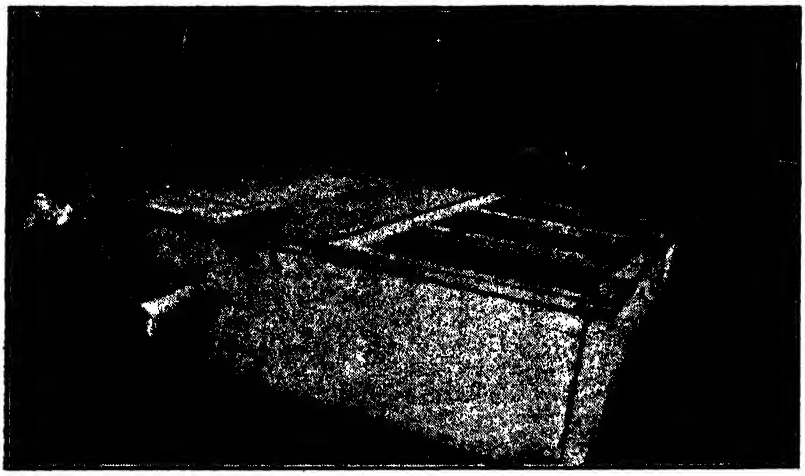


Fig. 5.
An Improved Type of Hover.

Until the chickens are a few days old a portable partition should be placed across the main run to keep them close to the brooder. A suitable partition board, illustrated in Fig. 7, is about 12 inches high, with a block of 3 inch x 2 inch or larger wood nailed on one side at the bottom, to make it stand in any position desired.

Construction of Hovers.

The hovers should be constructed mainly with 1 inch timber, and it is preferable to lay down the wooden floor underneath without breaks at each section. This floor should be made the width of the hovers and have 1 inch cleats nailed underneath at intervals so that there is a circulation of air underneath the floor to keep it dry. A 12-inch movable ramp should be fitted at either

side of each compartment, so that the chickens may move out of the hover at night time without getting over a ledge, but if desired the floor can be continued the full width of the back compartment instead of the ramp on that side.

The wooden portion of the floors should be covered with 2- or 3-ply malthoid to facilitate cleaning and keep them in a sanitary condition, and it is an advantage to cover the hovers with a piece of the same material in order to prevent the escape of hot air in the event of curtain, is that a light flannel material or hessian is used, and this quickly becomes worn out, with the result that cold air blows underneath the brooder. The best type of material is check kersey (collar check, which is used for lining horse collars), and although it is expensive it will last considerably longer than lighter materials. If the curtains are tacked to a lath and fitted by means of a wire catch on to the hovers, they can be removed at any time without difficulty. This is desirable during the warmer weather and when

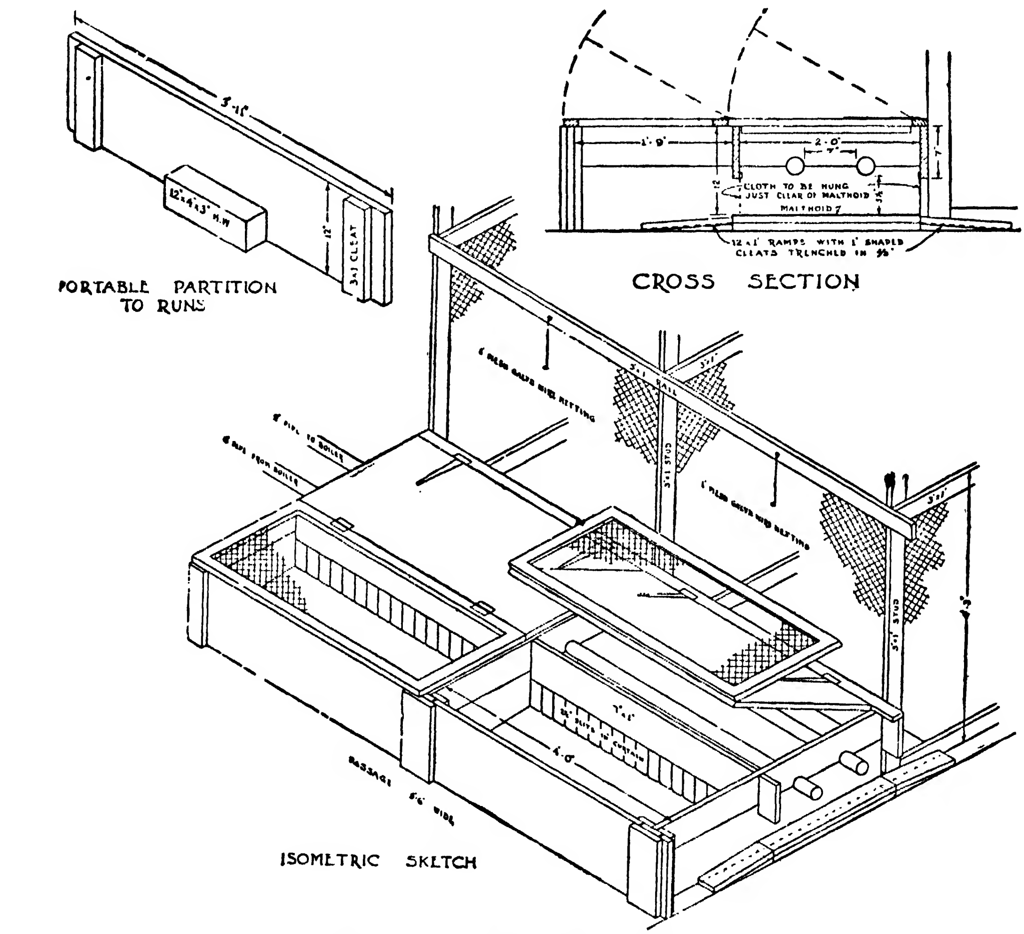


Fig. 6.—Diagrams of the Types of Hover Brooder shown in Fig. 5.

cracks occurring in the lid. It is not advisable to use tongued and grooved timber in the construction of brooders, owing to the difficulty of combating a possible occurence of vermin.

The Curtains.

It is most important that the curtains fitted to both sides of the hover be of a heavy, closely woven, soft material, so that they do not become easily frayed or picked by the chickens. The material should be slit every 2½ inches. A common mistake made in the construction of hovers, or any type of brooders fitted with a cooling off the chickens before they are removed from the brooders.

Simple Hovers.

Those who wish to reduce costs of installation to a minimum can adopt the ordinary type of hover, as shown in Fig. 7, which if fitted with satisfactory curtains will give results equal to the other types.

The hover should be made of ¾-inch or 1-inch softwood, using wide boards for the top in preference to narrow ones in order to have as few cracks

Fig. 7.

The Ordinary Type of Hover Brooder.

as possible, but it is an advantage in any case to cover the top with a sheet of malthoid to facilitate cleaning. The length of the hover can be 3 feet 6 inches or 4 feet and the width 2 feet. The sides and ends are 7 inches deep, with a movable curtain 5 inches wide fitted all round and just clear of the floor as previously described.

A wooden floor 2 feet wide with a 12-inch wide ramp on each side should be fitted under the hover in the same manner as for the "improved" hover type and the floor covered with malthoid.

The hovers can either stand 6 to 9 inches clear of the dividing fences, which permits of wider runs, or be made just to clear the fences, in which case they should not be less than 4 feet long. A portable dividing board for one side of the hover is necessary to keep the chickens from straying too far when first put in.

A suitable position for the pipes is about 3 feet from the back fence of the runs and they should be spaced 7 inches apart. The ends of the hover are scalloped out to fit securely on the pipes.

Methods of Installing the Boiler.

There are two proven methods of installing the boiler for this system of brooding. In the first the boiler is sunk in a pit, with the pipes gradually rising at least ½ inch in every 10 feet from the boiler to the farthest end, with an exhaust pipe at that point. In the other the boiler is placed on the floor level, and the pipes should be level throughout the length of the brooders, with an expansion pipe at least 12 feet high and 1¼ inches in diameter at the outlet on the forward pipe. In both of these installations the pipes through the brooders must be 2 inches in diameter and should be 5½ inches from the floors of the brooders or 7 inches above the concrete floor. Both methods are illustrated. (Figs. 10 and 11.)

Of the two methods, the first gives somewhat greater efficiency with a lower fuel consumption, but has the disadvantage that a watertight pit has to be constructed unless the fall of the ground permits of having a lower floor level

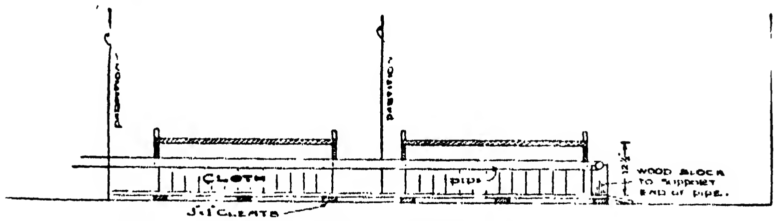


Fig. 8.—Longitudinal Section of Simple Hover (Fig. 7).

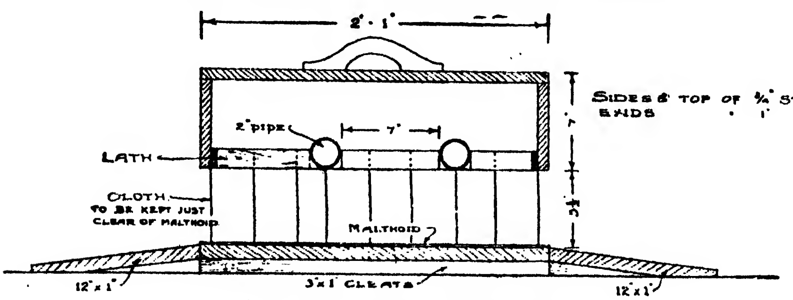


Fig. 9.—Cross Section of Simple Hover.

upon which the boiler can be placed. Where a pit is necessary, it is essential that it should be well constructed in order to avoid seepage in a wet season. It is also advisable to grade the floor to suit the rise in the pipes to avoid having the pipes higher above the chickens at the one end, or raising the brooders to suit.

The advantages gained by having the boiler on the floor level are that the system can be installed in an existing shed with a level floor, or where a floor is being laid it can be made level instead of being graded; and it is easier to attend to the boiler than when it is in a pit.

Mistakes in Installation.

Boiler in Pit.

Some of the main faults observed in the installation of the first-mentioned system are:—

(*a*) The boiler is not sunk low enough to allow of the forward pipe being connected to the top outlet of the boiler and rising gradually from the boiler to the other end of the brooders.

(*b*) The expansion pipe is placed at the boiler instead of the far end of the brooders.

(*c*) The water supply is connected to the forward pipe instead of the return.

(*d*) The pipes are not given sufficient rise to ensure proper circulation; it should be understood that the greater the rise in the pipes from the boiler, the better will be the circulation, but an excessive rise results in having the pipes too high above the chickens at the one end of the brooders.

Boiler on Floor Level.

Common faults seen when the boiler is on the floor level are:—

(*a*) The pipes are not level throughout the brooders. This is most important because any slight rise or fall will cause a sluggish circulation; even an inch variation from the level will have this effect. A spirit level resting on the pipes is of no value for ascertaining the correct levels because of inequalities in the pipe; the most satisfactory method is to use either a long "straight-edge" or boning rods for sighting the levels.

(*b*) The expansion pipe is either not placed next to the boiler on the forward pipe, or is less than 1¼ inches in diameter and not 12 feet high.

(*c*) The supply tank is placed on the forward pipe instead of the return or is situated too high above the boiler. The correct level is not more than 6 inches above the top of the water jacket of the boiler.

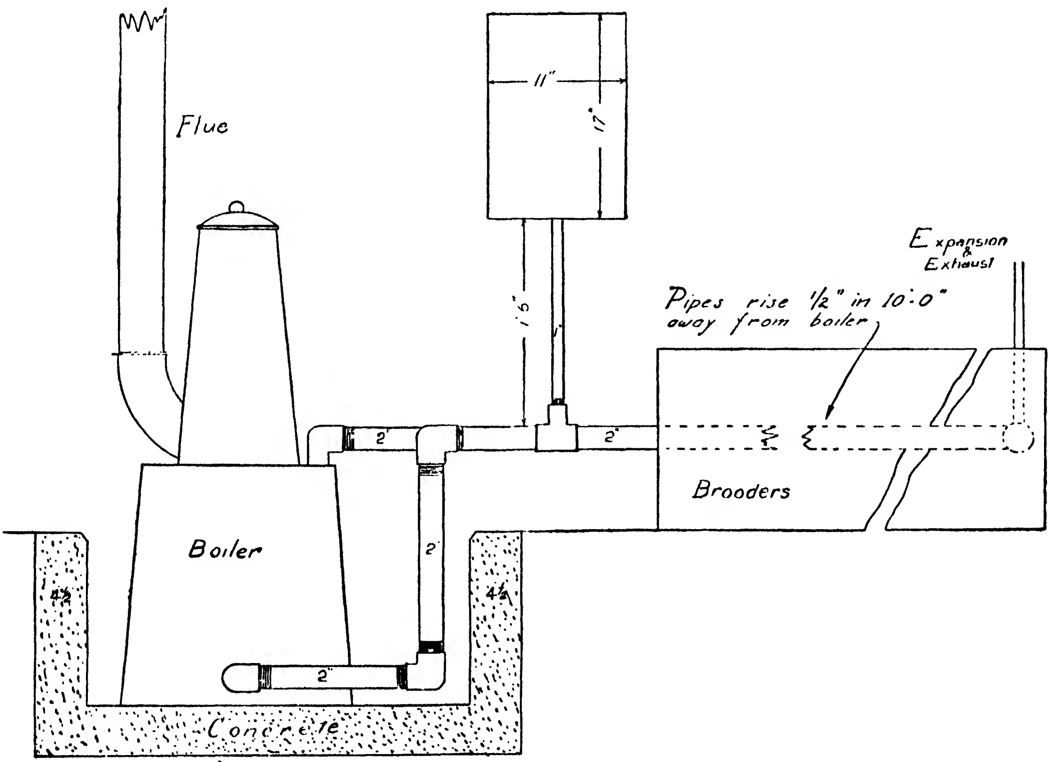


Fig. 10.—Boiler Installed in a Pit.

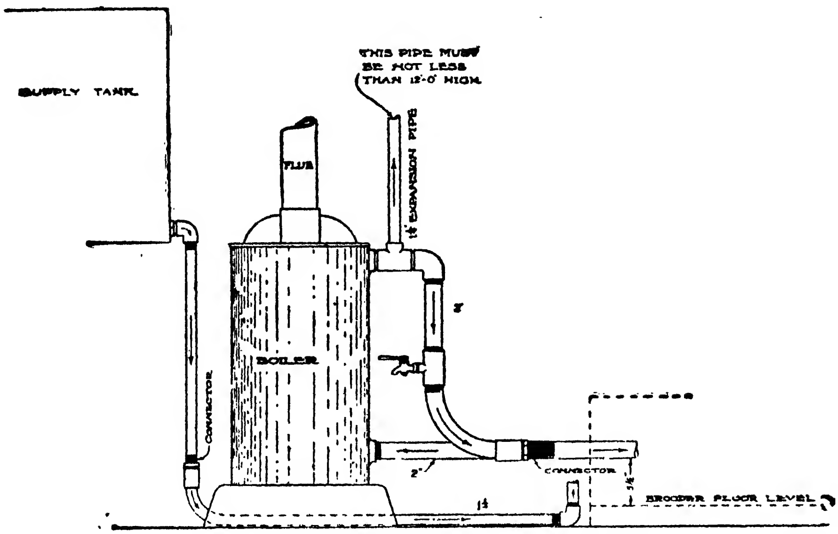


Fig. 11.—Boiler Installed on Floor Level.

A fault common in both methods is that the flue of the boiler is either not long enough or is too long. The exact length cannot be laid down, as considerable variation is necessary to suit the position of the brooder house and the height of the roof. For instance, if a brooder house is situated on the top of a hill, a shorter flue would be required than for one in a lower position, but usually 2 or 3 feet above the highest point of the roof is satisfactory. The main essential is to ensure that the fire burns properly in all weathers, and lasts nine to ten hours without re-stoking.

Wheat for Poultry, Pigs, Etc.

OWING to weather conditions during the wheat harvesting period, a fairly considerable quantity of wheat was harvested in a condition not quite up to the F.A.Q. standard, especially in appearance. It should prove, however, quite satisfactory for poultry, pigs, etc., the comparative analyses below indicating that it is practically equal in feeding value to average quality wheat.

An analysis of a representative sample of the wheat has been made by the Department of Agriculture for the purpose of ascertaining the feeding value. This is shown in the following table, and an average analysis of a representative good type of wheat is given for comparison:—

Analysis of Wheat available at Concession Rates from the Australian Wheat Board.

Moisture	12.22
Total ash	1.34
Crude protein	11.06
Ether extract (fat)	1.44
Crude fibre	1.88
Nitrogen free extract	72.06
	100.00
Albuminoid ratio	1 : 6.8
Nutritive value	86.36

Average Composition of Good Type Wheat.

Moisture	10.5
Ash	1.8
Protein	11.9
Ether extract	2.1
Crude fibre	1.8
Nitrogen free extract	71.9
	100.00
Albumenoid ratio	1 : 6.9
Nutritive value	88.5

This wheat has been placed in separate stacks by the Australian Wheat Board, and is being made available at special concession rates, in addition to the concession at present applying to the produce trade. The rates are available from the Board or its agents.

The Australian Wheat Board has decided that the produce trade will be supplied mainly with this type of wheat, special concession rates being given as indicated. In addition, to meet any special requirements the Board will, if desired, sell up to 25 per cent. of wheat of F.A.Q. standard; in this latter case the ordinary market rates as fixed for the produce trade will apply.

War Gossip is Dangerous. Guard Your Tongue.

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
		1943.
F. and C. Ryall, 5 Western Avenue, West Wollongong ...	57	1 Mar.
McGarvie Smith Animal Health Farm, Liverpool ...	65	1 „
New England University College, Armidale ...	13	1 „
W. Boland, "Seaton," Inverell ...	9	1 „
Parker Bros., Hampton Court Dairy, Inverell	104	1 „
A. D. Frater, King's Plain Road, Inverell ...	106	1 „
Wollongbar Experiment Farm ...	112	4 „
The Sydney Church of England Grammar School, Moss Vale ...	55	6 „
Koyong School, Moss Vale ...	2	6 „
New England Girls' Grammar School, Armidale	25	6 „
Lunacy Department, Parramatta Mental Hospital ...	31	6 „
A. E. Stace, Taylor Street, Armidale ...	31	7 „
W. C. Wyatt, Sherwood Road, Merrylands ...	29	12 „
A. C. O'Dea, Perry Street, Dundas ...	28	19 „
Trangie Experiment Farm, Trangie ...	138	19 „
Lunacy Department, Morisset Mental Hospital	80	25 „
W. W. Martin, "Narooma," Urana Road, Wagga ...	150	29 „
R. C. Dixon, Elwatan, Castle Hill (Jerseys) ...	23	3 April.
St. Michael's Orphanage, Baulkham Hills ...	18	5 „
Liverpool State Hospital and Home ...	102	10 „
F. C. Harcombe, Hillcrest Farm, Warialda Road, Inverell ...	32	15 „
Grafton Experiment Farm ...	190	17 „
Emu Plains Prison Farm ...	100	20 „
K. W. D. Humphries, "Karoola," Muswellbrook ...	162	24 „
H. F. White, Bald Blair, Guyra (Aberdeen Angus) ...	137	26 „
Berry Training Farm, Berry ...	162	31 „
S. E. E. Cohen, Auburn Vale Road, Inverell...	23	12 May.
B. N. Coote, Auburn Vale Road, Inverell ...	53	14 „
J. De Ville, Inverell ...	10	15 „
A. N. De Fraine, Reservoir Hill, Inverell ...	22	15 „
F. A. Mitchell, Long Plain Road, Inverell ...	32	15 „
Sir F. H. Stewart, Dundas ...	6	30 „
Cowra Experiment Farm ...	41	27 June.
P. M. Burtenshaw, Killean, Inverell ...	31	27 „
A. E. Liggins, "St. Leger Dairy," Kuring-gai Chase Road, Turramurra North ...	52	7 July.
Kahlua Pastoral Co., "Kahlua," Coolac ...	314	10 „
Lunacy Department, Rydalmere Mental Hospital ...	65	30 „
W. J. Frizelle, Rosenstein Dairy, Inverell ...	76	1 Aug.
W. Budden, "Hunter View," Kayuga Road Muswellbrook ...	18	7 „
.McLane, Wellingrove, Inverell ...	33	10 „

Owner and Address.	Number Tested.	Expiry Date.
		1943.
W. Willis, "Rosedale," Inverell ...	17	13 Aug.
E. L. Killen, "Pine Park," Mumbil ...	252	23 „
A. Hannaford, Braidwood ...	20	26 „
W. S. Grant, Braidwood ...	20	26 „
J. McKenzie, Inverell ...	35	28 „
Farrer Memorial Agricultural High School, Nemingha ...	39	29
The William Thompson Masonic School, Baulkham Hills ...	50	29 „
Navua Ltd., Grose Wold, via Richmond (Jerseys) ...	118	4 Sept.
Australian Missionary College, Cooranbong ...	113	8 „
Department of Education, Gosford Farm Home ...	40	29 „
A. L. Logue, 'Thornbro," Muswellbrook ...	46	13 Oct.
Woomargama Estate ...	207	22 „
W. J. Stephenson, "Hill View," Fig Tree ...	57	1 Nov.
Barnardo Farm School, Mowbray Park	75	4 „
State Penitentiary, Long Bay ...	10	9 Dec.
		1944.
Limond Bros., Morisset... ...	60	13 Jan.
J. M. Turnbull, "Pastime," Kayuga Road, Muswellbrook... ...	75	15 „
St. Ignatius College, Riverview ...	25	27 „
Department of Education, Yanco Agricultural High School ...	69	6 Feb.
Riverina Welfare Farm, Yanco ...	74	6 „
C. Wilton, Bligh Street, Muswellbrook ...	75	3 Mar.
N. L. Forster, Abington, Armidale (Aberdeen Angus) ...	188	12 „
Forster and Sons, Abington, Armidale (Jerseys)	87	13 „
Wagga Experiment Farm (Jerseys) ...	81	20 „
Lunacy Department, Callan Park Mental Hospital ...	26	1 May.
T. J. Wilks, "Oaks Farm," Muswellbrook ...	37	5 June.
New England Experiment Farm, Glen Innes (Jerseys) ...	73	27 „
G. T. Reid, "Narrengullen," Yass ...	274	3 July.
Farm Home for Boys, Mittagong ...	49	9 „
St. Vincent's Boys' Home, Westmead ...	26	20 „
Lidcombe State Hospital and Home ...	106	30 „
Hurlstone Agricultural High School, Glenfield ...	37	31 „
Ehsman Bros., Inverell ...	28	13 Aug.
Peel River Land and Mineral Co., Tamworth (Beef Shorthorns) ...	82	28 „
Bathurst Experiment Farm ...	24	9 Oct.
Lunacy Department, Gladesville Mental Hospital ...	34	23 Nov.
Hawkesbury Agricultural College, Richmond (Jerseys) ...	110	18 Dec.

Tubercle-free Areas.

The following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis :—

Bombala Area.
Inverell Area.
Braidwood Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

MAX HENRY, Chief of Division of Animal Industry.

CHEMISTRY AND AGRICULTURE—*continued from page 109.*

known is sodium fluosilicate which is recommended for fruit fly control, but others have been used, particularly overseas, barium fluosilicate, sodium fluoride, calcium fluoride, and natural and artificial cryolite being examples.

Hydrofluoric acid, in addition to its use in etching glass, is used in the analysis of silicate minerals, in removing sand from metal castings, and in cleaning the exterior of granite and sandstone buildings. A number of fluorine compounds, both organic and inorganic, are of antiseptic and medicinal value. Barium fluoride is an effective embalming medium.

(*To be continued.*)

Brucellosis-free Herd Scheme (Swine).

LIST OF ACCREDITED HERDS.

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Adams, J. P., "Melton," Daysdale.
Bathurst Experiment Farm, Bathurst.
Boardman, C., Camden.
Campbell, D., Hillangrove, "Wamberal," via Gosford.
Chapman, G. E. and Son, "Illabo Park," Alectown.
Cocks, F. D., "Condalarra," Gooloogong.
Cowra Experiment Farm, Cowra.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., "Glengar," Capertee.
Farrer Memorial Agricultural High School, Nemingha.
Foley, Mrs. E., Bligh Stud Piggery, Water Lane, Rouse Hill.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Holland, A. L., Argonne, Tubbul.
Hurlstone Agricultural High School, Glenfield.
Maybin, N. C., Towac, Orange.
McCaughey Memorial Agricultural High School, Yanco.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Government Agricultural Training Farm, Scheyville.
Shirley, G. F., "Camelot," Penrith.
Smith, J. M., Eulo Glen, Urana.
Stewart, Sir Frederick, "St. Cloud," Dundas.
Wagga Experiment Farm, Bomen.
White A. N., Blakeney Stud, Orange.
Williams, G. R. B., "Gwandalan," Grenfell.
Wilson, A. G., Blytheswood, Exeter.
Wollongbar Experiment Farm, Wollongbar.

Herds Other than Registered Stud Herds.

Bathurst Gaol, Bathurst.
Berry Training Farm, Berry.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Croft, H. M., "Salisbury Court," Uralla.
Glen Innes Prison Camp, Glen Innes.
Gosford Farm Home for Boys, Gosford.
Goulburn Reformatory, Goulburn.
Kenmore Mental Hospital, Kenmore, via Goulburn.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital, Orange.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital, Parramatta.
Peat and Milson Islands Mental Hospital, Hawkesbury River
Pollak, V., Marata, Harrow Road, Glenfield.
Smith, C. W. J., "Norbiton," Canadian Lead.
Stockton Mental Hospital, Stockton.
Waterfall Sanatorium, Waterfall.

Abortion-free Herds.

THE following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion-free :—

Owner and Address.	Number in herd.	Owner and Address.	Number in herd.
Bathurst Experiment Farm (Ayrshires) ...	24	Leitch, J. F., "Tunbridge," Merriwa (Aberdeen-Angus)	48
Bauerle, P. A., Holbrook ...	9	McEachern, H., Tarcutta (Red Poll) ...	9
Bush, W., Ben Lomond ...	18	Martin Bros., "Narooma," Urana-road, Wagga ...	125
Callan Park Mental Hospital (Aberdeen Angus) ...	41	Morisset Mental Hospital ...	80
Carrick, G., "Clonlea," Central Tilba ...	37	Navua Ltd., Grose Wold, via Richmond (Jerseys) ...	122
Cowra Experiment Farm (Ayrshires) ...	71	New England Experiment Farm, Glen Innes (Jerseys)	97
Department of Education—Farm Home for Boys, Gosford ...	36	New England University College, Armidale ...	16
Department of Education—Farm Home for Boys, Mittagong...	36	Peel River Land and Mineral Co., Tamworth ...	82
Dixson, R. C., "Elwatan," Castle Hill ...	24	Reid, G. T., "Narrangullen," Yass ...	171
Fairbridge Farm School, Molong ...	93	Robertson, D. H., Scone ...	82
Farrer Memorial Agricultural High School, Nemingha	35	Rydalmere Mental Hospital, Rydalmere ...	57
Forster and Sons, Abington, Armidale (Jerseys) ...	265	Salway, A. E., Cobargo ...	95
Forster, N. L., Abington, Armidale (Aberdeen-Angus) ...	188	Skinner, D. S., "Wyworrie," Ben Lomond ...	38
Gladesville Mental Hospital ...	34	Smith, Jas. C., Ben Lomond ...	83
Grafton Experiment Farm (Aberdeen-Angus) ...	29	Stewart, Sir Frederick, "St. Cloud Stud," Spurway-street, Dundas ...	9
Grafton Experiment Farm (Australian Illawarra Shorthorns) ...	93	Trangie Experiment Farm, Trangie ...	88
Hawkesbury Agricultural College, Richmond (Jerseys)...	108	Wagga Experiment Farm, Bomen, N.S.W. ...	81
Hicks A. A., Estate, Culcairn ...	52	Walker, Jas. R., "Strathdoon," Wolseley Park ...	32
Hill, E. Pritchard, Bowling Alley Pt. (Jerseys) ...	96	White, F. J., and Sons, Bald Blair, Guyra (Aberdeen-Angus) ...	189
Hordern, E. D., Cabramatta (A.I.S.) ...	95	Williams, Chas., Ben Lomond ...	27
Hurlstone Agricultural High School, Glenfield ...	39	Young, A. H., "Rock Lynn," Cudal (Polled Beef Shorthorns) ...	12
Killen, E. L., "Pine Park," Mumbil ...	223		

MAX HENRY, Chief of Division of Animal Industry.

The Agricultural Gazette.

April, 1943.

Stamp Out Swine Fever.

No worse disaster could threaten the pig industry in this country than the permanent establishment of swine fever. In the United States of America the Bureau of Animal Industry recently estimated that swine fever losses in that country in a single year have been as high as 65,000,000 dollars, and the probable average annual loss for any ten-year period about 20,000,000 dollars.

Australia had been free of swine fever for fourteen years until the present outbreak occurred towards the end of 1942. Considering the virulence of this outbreak, and the great probability of widespread infection because of the origin of its introduction, there is cause for much satisfaction in the fact that to date the disease has been confined to the County of Cumberland, except for one outbreak at The Oaks, one at Albury and two at Hay. Furthermore, there has been a decided falling off in the number of outbreaks over the past several weeks.

Whilst the present position is very hopeful it would be foolish to assume that all danger has passed. It most definitely has not. To safeguard the pig industry against the permanent establishment of swine fever in this country it is necessary to continue the drastic combative measures. Even though these very necessary measures have caused much inconvenience, dislocation of trade and financial loss, it will be readily admitted, when eventually the disease is stamped out, that it was a small price to pay for freedom from such a menace as swine fever.

Up to the present, about 10,000 pigs have been destroyed, over £38,000 paid as compensation, and about £200 spent on necessary equipment. Compensation has been paid out of the Swine Compensation Fund; in other words, the industry has provided its own insurance.

Rubber Shortage Threatens Industry.

AUSTRALIA'S industrial and commercial activities are in danger of being severely curtailed and disorganised by an acute rubber shortage. Action must be taken immediately if we are to avert a major wartime catastrophe in industry.

Rubber-tyred transport has replaced horse-drawn iron-tyred vehicles to such an extent,

and has, in addition, so supplemented the rail carriage of goods, that we will find it one of the toughest problems ever faced to devise substitute transport in the short time left in which to do the job.

The tragedy is that so few realise the seriousness of the present position. It was recently estimated that only about 11 per cent. of the 217,000 commercial and industrial motor vehicles now used in industry in this country are likely to be in commission in twelve months time, due to lack of tyres. This means that 193,000 of the 217,000 motor vehicles at present serving the nation's war effort and trade will be off the road by the end of 1943. When the tyres at present being used are worn out there will be no replacements.

Avoidance of overloading, travelling at reduced speed, maintaining correct tyre pressure, and other precautions all help to prolong the life of tyres, but all this care will postpone for a few months only the full impact of the crippling effect that rubber shortage is certain to have on Australia's industrial effort.

Earlier in the war, England had to contend with a similar problem. Engineers in that country invented improved types of iron-tyres and iron-tyred wheels to enable quick conversion of rubber-tyred vehicles. Special attention was paid to lightness of draft and springing. According to reports as to their success, this appears to have been one of the Empire's war efforts which was neither too little, nor too late. What is Australia doing to solve her parallel problem?

Agricultural Education Through Correspondence Courses.

THE following courses are available by correspondence at Sydney Technical College, Ultimo:—

Agriculture.—Covering the principles and practice of Agriculture.

Animal Husbandry.—Covering the domestic animals in health and in disease.

Pig Raising.—This is a new course of six months' duration, and it includes: Economics of the pig industry, markets, position of the pig industry in New South Wales; accommodation and equipment; pig breeding and pig breeds; pig judging and selection of breeding stock; general management of commercial pigs; principles and practice of pig feeding; castration, slaughtering and bacon curing on the farm; health and disease in pigs.

Poultry Farming.—Also a new course occupying six months. The following are included: Selection and planning of the poultry farm, building and equipment; how to stock up a farm; commercial breeds, and standards; incubation; selection of breeding stock, culling; brooding chickens, 2nd and 3rd stage of rearing; management of laying stock; feeding; growing green feed; marketing eggs, washing, grading, etc.; feeding and drinking utensils; table poultry; poultry parasites; the utility standard.

Sheep and Wool Classing.
Farm Mechanics.
Station Book-keeping.

Inquiries should be addressed to The Superintendent of Technical Education, Sydney Technical College, Harris-street, Ultimo.

Food Position Causes Concern.

SIR Earle Page, M.P., recently expressed grave concern at the food position in Australia. He said: "The serious mess into which food production is drifting is due to three main causes:—

"(1) The absence of an over-all food policy that provides for and co-ordinates army, civilian and export needs.

"(2) The failure to establish a Ministry of Food which can plan and organise our production and direct our man-power and equipment into the right channels.

"(3) The absence of a plan to stabilise costs of production by subsidising the cost of living and stimulating production of ample supplies by remunerative prices, as has been done so successfully in England.

"Surely an over-all food policy and unified food administration should be established in Australia before the Minister for External Affairs, Dr. Evatt, goes away to the International Food Conference."

WAR AGRICULTURAL COMMITTEES DISCUSS

The Road Transport of Primary Products.

Questions Answered on Transport, Fuel and Tyre Problems.

MANY questions relating to the control of road transport under the National Security Regulations, asked by delegates to the recent conference of officials of local War Agricultural Committees of the Gunnedah district, were answered by Mr. R A. Bradley, of the Department of Road Transport.

The summaries of the answers to the more important questions, printed below, should prove of very great interest and value to farmers generally throughout the State.

TRANSPORT PROBLEMS.

Why is the Director of Emergency Road Transport concerned with the transport of wheat and other primary products?

Mr. C. N. Neale, Director of Emergency Road Transport (New South Wales) is the supreme authority for road transport in New South Wales under National Security Regulations. He is a Commonwealth functionary. The regulations are designed to make more effective use of transport in the country for the prosecution of the war and for the common good. Sectional and individual interests have "gone by the board." Individuals no longer have sole control over their vehicles. The Director, to achieve his objects has, as you are aware, delegated certain of his powers to others whom you are now familiar with under the title of "Proper Authorities."

Are both Transport Rationalisation Committees and District War Agricultural Committees necessary?

I suggest they are both necessary, but we want close co-operation and perhaps, in course of time, there will be a degree of fusion. There should be no antagonism between them since they have a common aim—the greatest good for the community. Obviously the W.A.C.'s have to deal with agricultural transport problems, but in the towns there are many transport matters inappropriate to handling by the W.A.C.'s. Accordingly, Transport Rationalisation Committees exist in the great majority of Shires and Municipalities outside Sydney and Newcastle.

What are the objects and what are the principal provisions of Road Transport Control Order No. 3?

I link this question with the first one. I would like to stress that it is the policy of the Director to administer, and have administered by "Proper Authorities" on his behalf, the order in such a way as to get the best voluntary co-operative use of available transport.

Road Transport Control Order No. 3 provides that: **"Every vehicle shall be used by or on behalf of the owner of such vehicle or any other person for the time being having possession or control thereof for such purposes and in such manner as a 'Proper Authority' may from time to time require or direct."**

Vehicle means, "vehicle of any kind (other than a vehicle used upon a railway or tramway) whether propelled or capable of being propelled by mechanical power or whether drawn or capable of being drawn by animal power used or capable of being used for the transport of goods or passengers."

In this State, "Proper Authority" means the Director of Emergency Road Transport or any person authorised by him in writing to perform any act or do anything pursuant to the part of the Order relating to the use of vehicles.

The Order also particularises that a "Proper Authority" may direct that the person owning, possessing or controlling a vehicle shall—

(*a*) pool any vehicle facilities with those of any other specified person or persons;
(*b*) accept for delivery and deliver any specified goods;
(*c*) accept for carriage and carry any specified persons;
(*d*) let or supply any vehicle or facility to any other specified person or persons;
(*e*) otherwise deal in any specified manner with any vehicle or facility.

Other important provisions of the Order are as follows: I quote—

"(6) As and when directed by a proper authority every vehicle shall be maintained by the owner thereof in good order and condition and shall be located in any specified place and shall not be removed from such place without the direction or permission of a Proper Authority.

(7) The owner of any vehicle or any other person for the time being having possession or control thereof or any person in the employ of either of such persons in the capacity of a driver shall drive or cause or permit such vehicle to be driven in accordance with the terms of any requirement made or direction given by a Proper Authority.

(9) A Proper Authority may—

(*a*) **inspect any vehicle and may require the owner or any other person for the time being having possession or control thereof to afford reasonable facilities for enabling an inspection to be made at the time and in the manner directed.**

(*b*) Require the owner or any other person for the time being having possession or control of any vehicle to furnish to him either verbally or in writing such particulars as are directed.

(10) Any requirement made or direction given under this Part may be made or given verbally or in writing or partly verbally and partly writing."

Why cannot District War Agricultural Committees direct and control the transport?

Under Control Order No. 3 a "body" cannot be appointed to do the directing. The Director of E.R.T. can delegate his authority only to a *person*. This ensures an element of personal responsibility. Both the Director of E.R.T. and the people in the affected locality then know who is responsible.

Is there any legal backing for a "Proper Authority" to give directions to farmers and carriers?

This cropped up in practice. There is no room for doubt. A "Proper Authority" has full legal powers to carry out his functions and is issued with a legal instrument setting out his appointment for the particular locality or zone and his functions, *e.g.*, wheat transport.

What should a "Proper Authority" do if his directions are disobeyed?

Control Order No. 3 says a Proper Authority "may give direction verbally or written or partly both." In most cases it will be verbal. If that is disobeyed write the direction in simple form, *e.g.*, "I, John Smith, Proper Authority for the Shire of ———, under Land Transport Regulations, do hereby direct you to cease carting wheat until further orders." That kind of direction proved sufficient in all but one instance. In that instance the Director of E.R.T. sent a telegram with satisfactory results.

Can the police help in such cases?

No, except for moral support to a Proper Authority. However, the issuing or withholding of supplementary petrol allowances by the police is a useful leverage—co-operation between the police and the "Proper Authorities" could work well to deal with unsatisfactory persons.

Who is responsible for damage to wheat or hay left in the paddock as a result of direction from a "Proper Authority"?

I think the farmer is at loss, but he may appeal to the Director of E.R.T., if he believes the Proper Authority is not giving him a fair deal.

If a lorry owner utterly refuses to comply with directions, can a "Proper Authority" take his lorry and put a driver on for the particular purpose?

Yes. "Proper Authorities" in many cases were not aware of all their powers, or they would have planned a procedure for the locality to prevent any carrier "picking the eyes" out of the carrying in the district. However, I would urge great discretion, and, if possible, reference to the Director in such cases.

By whom should "Proper Authorities" be nominated and appointed?

Some W.A.C.'s thought they had only to nominate someone and he would be appointed; but the Director of E.R.T. will only make the appointment if he is fully satisfied The local people should be concerned in the nomination.

Have the appointments made last year in connection with the wheat harvest been revoked?

No, but they may be revoked soon. Others, *e.g.*, for fruit transport, have recently been appointed.

It is necessary or advisable to have more than one "Proper Authority" in a Shire or a War Agricultural District?

It certainly is necessary; *e.g.*, in one shire, near Parkes, where approximately 5,000,000 bushels of wheat is produced, there were about sixteen "Proper Authorities" in the Shire. Each of them had a zone of the Shire. In some cases there were several zones to a particular silo. Co-operation between the "Proper Authorities" was essential, and this was accomplished under the chairmanship of the shire clerk. Day by day supervision was possible and the transport plans were particularly successful.

Has a "Proper Authority" the power to allocate silo space?

He has no power over silo space, except indirectly by his control over the transport required to take wheat into the silo.

Will "Proper Authorities" be given power before next harvest to allocate silo space in conjunction with silo agents?

I am not competent to answer. I suggest this be submitted to the Silo authorities. Better liaison is required between the "Proper Authorities" and the Silo authorities.

Has a "Proper Authority" the right to require silo agents and receiving agents to disclose individual intake figures?

No.

Has a "Proper Authority" the power to direct farmers and/or carriers to a particular silo or stacking dump or mill?

Yes.

Have "Proper Authorities" or District War Agricultural Committees or Transport Rationalisation Committees any right to fix wheat cartage rates or to enforce wheat cartage rates?

No. Cartage rates are a matter for the Prices Commissioner. However, after discussion between Transport Board and Deputy Prices Commissioner last year the latter indicated that it would be a physical impossibility for him to take care of every case because of the great number of districts and the harvest time factor, and that if the cartage rates in 1942 are not more than 12½-15 per cent. higher than the previous year he would not interfere.

Although "Proper Authorities" have not power to fix rates they were able in many instances last year to bring together carriers and farmers amicably to stabilise the rates on an honour basis. No cases of excessive rates were reported to us. If they had been they would have been referred to the Prices Commissioner.

Are the expenses of "Proper Authorities" and assisting committees met by the Director of Emergency Road Transport?

No.

Has the Liquid Fuel Board given consideration to the advisability of delegating to one particular responsible officer in Sydney, authority to confer with district "Proper Authorities" and police officers controlling transport or problems which require immediate decisions?

In effect that has been done. I make the effort myself, but it is of course physically impossible. The assistance of other officers within the building and elsewhere in the State is essential.

When special permits are issued in future for carting, would it not be preferable to issue them to primary producers and not to the carrier or carter?

"Special permits" apparently refers to the extra liquid fuel licences issuable in peak periods. This is a vexed question. A definite answer is impracticable. It must vary with circumstances and the individuals, farmers and carriers concerned, but generally speaking the operator of the vehicle should receive the special petrol licenses.

What objection would there be to all primary producers' essential vehicles being placed on the one priority?

The Commonwealth Government has fixed the priority classifications, and it has been fixed that Priority 4 will be granted to a primary producer's truck or, if he has no other vehicle, to his car. When this Priority 4 has been allotted to a vehicle, then for the remainder of the primary producers' cars Priority 8 or 12 will be applied, as fitting the case.

Can the police alter a priority without reference to your office?

Strictly speaking, no, except where it is a case of rectifying an anomaly.

Is there a ruling re priorities for primary producer trucks that are on producer-gas?

No special privileges. If the individual believes he has a special case he should communicate with our office, stating the case in detail.

Could local War Agricultural Committees be empowered to take an immediate census of local transport facilities in preparation for the handling of next season's wool and wheat?

No. W.A.C.'s cannot make such a census compulsory. Only a "Proper Authority" can do that.

Would it not help to conserve transport if the Railway Authorities were prevailed upon to waive regulations restricting motor-lorry transport along roads running parallel to existing railway lines?

Under the State Transport (Co-ordination) Act, 1931, road vehicles may run up to 50 miles in competition with the railways before certain charges of a restrictive nature are imposed. However, because of the present vehicle, liquid fuel and rubber position, long road trips should not be undertaken if railway facilities can be used.

In the case of pools of week-end labour being formed, what arrangements can be made for the transport of that labour to the farm?

Instructions were sent to the Police *re* conveyance of "land army" workers. Petrol is to be issued to enable volunteers to go to field operations—on the recommendation of W.A.C.'s or Transport Rationalisation Committees. This has been done in many cases.

QUESTIONS ABOUT LIQUID FUEL.

Can "Proper Authorities" or War Agricultural Committees or Rationalisation Committees issue motor spirit consumer's special licences, or ration tickets?

No. It is a Police job.

What is the function of a "Proper Authority," War Agricultural Committee or Rationalisation Committee in the matter of the issue of special petrol licences?

Their function is to make a recommendaiton to the Police as to what quantity should be authorised. The recommendation should set out:—

(*a*) Facts concerning the quantity to be carted and the distance.
(*b*) That there is no more satisfactory alternative means or person to do the job.
(*c*) That the job cannot be diverted to a vehicle equipped for use of substitute fuel, or a horse-drawn vehicle.

The Police are not obliged to follow the recommenation.

Are the Police the final arbiters on applications for special petrol licences?

In their Districts, yes.

Are power kerosene and diesel oil substitute fuels?

No. They take up tanker space and, through mercantile risks, cost seamen's lives just as does petrol. There is the urgency to conserve diesel and power kerosene as there is to conserve petrol.

Can power kerosene be used as fuel for driving vehicles on the public roads?

No. If it be used on roads then it will not be obtainable when needed for essential purposes on the farm.

Can substitute fuels be used without permission from the Liquid Fuel Control Board?

No Recently all substitute fuels were brought under control and it is necessary now to have Liquid Fuel Control Board's permit to use any substitute fuel.

What is the policy of the Liquid Fuel Control Board regarding substitute fuels, particularly producer-gas?

It is the Board's firm policy that all should get on to substitute fuels as quickly as possible, particularly on to producer-gas. There has been a recent shortage of charcoal, but this we hope will only be temporary. Prices of charcoal were recently increased to make its production more attractive.

Have steps been taken to ensure that essential services have first call on all charcoal supplies?

Yes; *e.g.*, during the present charcoal shortage all Sydney taxi-cabs have been deprived of charcoal supplies.

(*Continued on page* 158.)

Approved Seed.

April, 1943.

To assist in the production and distribution of approved seed of recommended varieties of crops and vegetables, the Department publishes in this list each month the names and addresses of growers of such seed. For this service a charge of 2s. 6d. is made for each insertion of each variety listed. The number of varieties listed on behalf of each grower will be restricted to twenty-five for the time being. The Department may inspect the crop producing the seed, and in all cases a sample of the seed must be sent to the Department of Agriculture with information as to the location of its production, and must be accompanied by the fee indicated above.

If any seed producer does not wish to pay the advertising charge he may submit his name with the variety of seed and sample to the Department, and if it is approved his name will be listed in the Department and information will be supplied regarding it to inquirers.

Wheat—

Bencubbin.—Manager, Experiment Farm, Wagga. (5s. 6d. bushel, f.o.r.)
Bencubbin.—Manager, Experiment Farm, Temora. (5s. 6d. bushel, f.o.r.)
Bencubbin.—Manager, Experiment Farm, Cowra. (5s. 6d. bushel, f.o.r.)
Bencubbin.—Manager, Experiment Farm, Trangie. (5s. 6d. bushel, f.o.r.)
Bordan.—Manager, Experiment Farm, Wagga. (5s. 6d. bushel, f.o.r.)
Bordan.—Manager, Experiment Farm, Cowra. (5s. 6d. bushel, f.o.r.)
Dundee.—Manager, Experiment Farm, Wagga. (5s. 6d. bushel, f.o.r.)
Dundee—Manager, Experiment Farm, Cowra. (5s. 6d. bushel, f.o.r.)
Eureka.—Manager, Experiment Farm, Temora. (5s. 6d. bushel, f.o.r.)
Eureka.—Manager, Experiment Farm, Cowra. (5s. 6d. bushel, f.o.r.)
Eureka.—Manager, Experiment Farm, Trangie. (5s. 6d. bushel, f.o.r.)
Eureka 2.—Manager, Experiment Farm, Trangie. (5s. 6d. bushel, f.o.r.)
Ford.—Manager, Experiment Farm, Wagga. (5s. 6d. bushel, f.o.r.)
Ford.—Manager, Experiment Farm, Cowra. (5s. 6d. bushel, f.o.r.)
Ghurka.—Manager, Experiment Farm, Wagga. (5s. 6d. bushel, f.o.r.)
Gular.—Manager, Experiment Farm, Temora. (5s. 6d. bushel, f.o.r.)
Koala.—Manager, Experiment Farm, Temora. (5s. 6d. bushel, f.o.r.)
Pusa 111.—Manager, Experiment Farm, Temora. (5s. 6d. bushel, f.o.r.)
Ranee.—Manager, Experiment Farm, Wagga. (5s. 6d. bushel, f.o.r.)
Totadgin.—Manager, Experiment Farm, Trangie. (5s. 6d. bushel, f.o.r.)
Waratah.—Manager, Experiment Farm, Wagga. (5s. 6d. bushel, f.o.r.)

Wheat—(continued.)

Waratah.—Manager, Experiment Farm, Cowra. (5s. 6d. bushel, f.o.r.)
Waratah.—Manager, Experiment Farm, Trangie. (5s. 6d. bushel, f.o.r.)
Bungulla.—Manager, Experiment Farm, Temora. (5s. 6d. bushel, f.o.r.)
Bungulla.—Manager, Experiment Farm, Trangie. (5s. 6d. bushel, f.o.r.)
Gluford.—Manager, Experiment Farm, Cowra. (5s. 6d. bushel, f.o.r.)

Oats—

Belar.—Manager, Experiment Farm, Temora. (4s. 6d. bushel, f.o.r.)
Belar.—Manager, Experiment Farm, Cowra. (4s. 6d. bushel, f.o.r.)
Belar—Manager, Experiment Farm, Trangie. (4s. 6d. bushel, f.o.r.)
Buddah.—Manager, Experiment Farm, Trangie. (4s. 6d. bushel, f.o.r.)
Fulghum.—Manager, Experiment Farm, Temora. (4s. 6d. bushel, f.o.r.)
Gidgee.—Manager, Experiment Farm, Temora. (4s. 6d. bushel, f.o.r.)
Gidgee.—Manager, Experiment Farm, Trangie. (4s. 6d. bushel, f.o.r.)
Kareela.—Manager, Experiment Farm, Trangie. (4s. 6d. bushel, f.o.r.)
Mulga.—Manager, Experiment Farm, Temora. (4s. 6d. bushel, f.o.r.)
Mulga.—Manager, Experiment Farm, Trangie. (4s. 6d. bushel, f.o.r.)
Weston.—Manager, Experiment Farm, Cowra. (4s. 6d. bushel, f.o.r.)
Wongan.—Manager, Experiment Farm, Temora. (4s. 6d. bushel, f.o.r.)

Barley—

Pryor—Manager, Experiment Farm, Wagga. (5s. bushel, f.o.r.)
Trabut.—Manager, Experiment Farm, Wagga. (5s. bushel, f.o.r.)

Tomatoes.

Marvana — Rumseys Seeds Pty. Ltd., 331 Church-street, Parramatta.
Australian Earliana—Rumseys Seeds Pty. Ltd., 331 Church-street, Parramatta.
Red Marhio No. 95—Rumseys Seeds Pty. Ltd., 331 Church-street, Parramatta.
Vetemold—Rumseys Pty. Ltd., 331 Church-street, Parramatta.
Potentate—Rumseys Pty. Ltd., 331 Church-street, Parramatta.

Onions.

Extra Early Flat White—Mr. Sam Anthony, High-street, Hillston.
Odourless—Mr. Sam Anthony, High-street, Hillston.

PLANT DISEASES

Notes contributed by the Biological Branch

Division of Science Services

DISEASES OF ONIONS.

ONIONS are less subject to disease in the field than many vegetable crops, and the careful choice of soil for seed-bed and crop and the adoption of a suitable system of rotation will go a long way towards the production of a healthy crop.

Downy Mildew.

This is the most serious fungous disease of onions. In coastal districts, mildew usually occurs each spring, but in inland areas it is only important in wet seasons. It is caused by a parasitic fungus which attacks the leaves, and in seed crops, the stalk of the seed head also, developing on them a furry covering of spores. These are carried by air currents, so that the disease will spread very rapidly in suitable weather. The development and spread of mildew are favoured by periods of wet cool weather, and usually the disease develops most quickly and does most damage in damp places where air and soil drainage are poor. Plants which become affected during a period of wet weather may be able to outgrow the disease if a spell of dry weather ensues.

Under conditions favourable to its development the downy mildew fungus spreads throughout the plant tissues and is present in the bulbs after the leaves have died. It also spreads to the flower, and seed from diseased plants may carry infection internally or as an external contaminant.

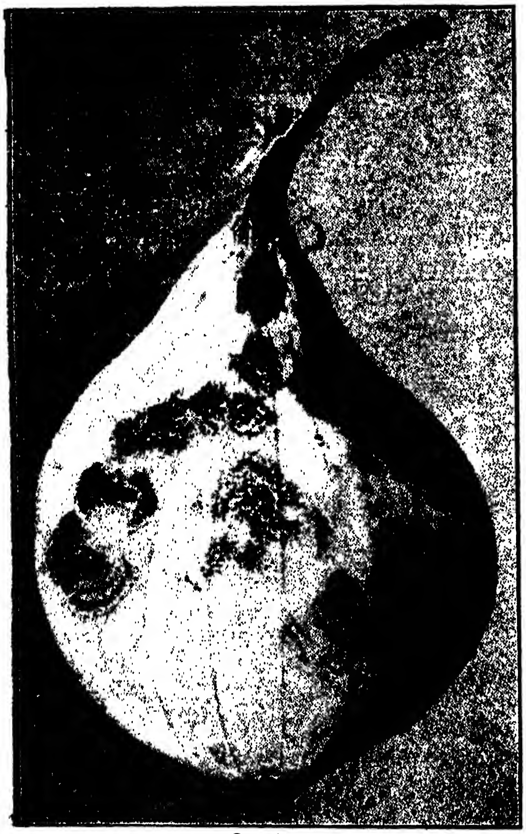
The sources of infection for the crop are infected bulbs used for seed production in neighbouring beds, infected or contaminated

Downy Mildew of Onion.
The leaves are blighted and covered with a furry outgrowth of the fungus.

seed, and the refuse of diseased plants from a previous crop.

Smudge.

This is a fungous disease which commences as small green to black dots on the outer scales just before harvest and develops further during storage. The dots are usually arranged in concentric rings. The disease may cause a shrinkage of bulbs in storage and increases their liability to other rots if the bulbs are not dried out properly before bagging. If the bulbs are well dried the disease may only attack the fleshy scales lightly. White varieties are very susceptible to smudge, but most coloured varieties are resistant. The smudge fungus is carried over from season to season in refuse in the soil and on diseased bulbs kept for seed production.



Smudge.
Note the concentric rings of black dots, which are the fruiting bodies of the fungus. [*After Walker.*

Black Mould.

This disease attacks bulbs before and after harvest, but is most serious in storage. It causes a soft rot which progresses inward towards the neck, paving the way for other moulds and bacteria which may complete the destruction of the bulb. The fungus lives on any dead plant material in the soil. Black mould attacks all types of onions, whilst smudge is confined almost entirely to white varieties.

Black Mould of Onion.
Black mould can be distinguished from other bulb rots by the black, powdery masses of fungous spores which develop on the surface of the outside scales, and between the scales which have rotted.
[*After Walker.*

White Rot.

This disease is caused by a soil-inhabiting fungus which attacks the roots and base of the scales. The first signs of infection are a yellowing and collapse of the leaves. A fluffy white growth can be detected on the bulb, and in the later stages, small black resting bodies of the fungus, about the size of turnip seed, develop over the diseased area. The disease is carried over on infected plant remains in the soil.

Storage Diseases.

Onions should be lifted as soon as mature, and allowed to dry out before bagging, either in the field or, if the weather is hot, on racks in an open shed. Insufficient drying out, or bruising or injury during harvesting, may lead to the development of decay during storage. White varieties need the most care.

Neck Rot.

This is a fungous disease affecting onions lifted during damp weather and not thoroughly dried out. It causes a brown

Onions Affected with White Rot.
Note black resting bodies of the fungus.

rot of the neck, or basal plate, or the fungus may develop around injuries. If conditions are damp the rotted areas become covered by a furry, grey mass of spores, followed by a crust of hard black material—the resting stage of the fungus. In wet seasons seed crops may be affected with neck rot in the field.

Soil Acidity.

Onions make only fair to poor growth in acid soils. The leaves yellow from the tips and wither away, and the bulbs produced are undersized. Under extremely acid conditions the crop may partially fail, and the grower may be led to believe that the plants are affected by some parasitic disease.

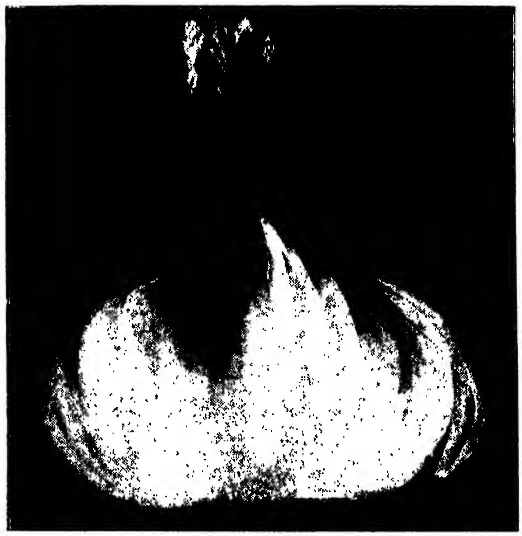
Control Measures.

If a soil more acid than pH 5.5 must be used for onions it should be limed well some months before planting, using ground carbonate of lime at the rate of 1½-2 tons per acre. Choose a well drained piece of soil, preferably in a position where dew or rain will dry off quickly, both for the seed-bed and the crop.

If the seed is not known to be free of mildew it should be steeped in hot water at 122 deg. Fahr. (50 deg. Cent.) for 25 minutes. Tie the seed loosely in cloth bags and suspend in a kerosene tin of water heated to 122 deg. Fahr. The temperature can be maintained by means of a small kerosene lamp beneath the tin, or the tin may be insulated in a box of straw. In either case a lid should be fitted to the tin.

Land which has carried a diseased crop should not again be used for onions for some years, and where possible the diseased refuse should be burned.

At harvesting any affected bulbs should be culled out and burned or buried deeply.



An Onions Affected with Neck Rot.
Cut longitudinally; note the brown rotted area progressing downwards from the neck.

To prevent losses from storage diseases, bulbs should be thoroughly dried out or cured before bagging and marketing. Artificial curing of white onions may be profitable where curing weather is unfavourable, or when neck rot has started to appear. This requires special equipment. The onions are placed in slatted crates in a kiln, and warm air at 100 to 120 deg. Fahr. is forced over them by a blower for several hours until the neck tissue is thoroughly dry. Best storage conditions for cured onions are 32 deg. Fahr. and 65 per cent. relative humidity.

New Plant Diseases.

DURING the six months ending December, 1942, the following diseases were recorded for the first time in New South Wales:—

Allium cepa, onion. *Phytophthora* sp. (seedling leaf blight); Wagga, Leeton.

Alternanthera sp., carpet weed. (*Heterodera marioni* (Cornu) Goodey (root knot); Metropolitan.

Avena sativa, oats. *Pythium* spp. (root rot); Cassilis.

Beta vulgaris, beetroot. *Pythium* sp. (sleepy disease); Metropolitan.

Brassica rapa, swede turnip. *Erysiphe polygoni D.C.* (powdery mildew); Nyngan. *Olpidium brassicae* (Wor.), Dangeard, (Olpidium disease); Leeton; this disease has been known to occur since 1935.

Calotropis gigantea, madar. *Cercospora* sp. (leaf spot); Grafton.

Campanula pyramidalis, campanula. Mosaic (spotted wilt virus); Metropolitan.

Gerbera jamesonii, gerbera. *Heterodera marioni* (Cornu) Goodey (root knot); Metropolitan.

Hypochaeris radicata, flat weed. *Bremia* sp. (mildew); Gosford, Metropolitan.

Lycopersicum esculentum, tomato. *Phytophthora cryptogea*. Pethyb. and Laff (collar rot); Green Valley.

Origanum vulgare, majoram. *Phytophthora* sp. (root rot); Metropolitan.

Pastinacea sativa, parsnip. Spotted wilt virus; Metropolitan. Leaves were bronzed and leaf bases and stems streaked with brown. Affected plants made a substantial recovery and produced an excellent crop of seed.

Phaseolus vulgaris, French bean. *Pythium* sp. (damping-off); Oberon.

Salvia farinacea, salvia. Mosaic (? spotted wilt virus); Metropolitan.

Salvia officinalis, sage. *Phytophthora* sp. (root rot); Metropolitan.

Syringa vulgaris, lilac. *Bacterium syringae* (van Hall) E.F.S. (blight); Exeter. This bacterium has been recorded previously attacking lemons and beans.

Veronica calycina, native speedwell. *Peronospora* sp. (downy mildew); Metropolitan.

The Road Transport of Primary Products.

(*Continued from page* 153.)

QUESTIONS *re* TYRES, TUBES, SPARE PARTS, AND REPAIRS.

What are the functions of "Proper Authorities," War Agricultural Committees and Rationalisation Committees with regard to expediting the release of tyres and tubes?

Under what circumstances will the Department of Emergency Road Transport make recommendations to the Department of Supply and Shipping for the immediate release of tyres and tubes?

In what type of cases are the services of the Police asked for in connection with the urgent release of tyres and tubes, and when are the services of the Police not required?

Are the procedures in operation for the urgent release of tyres and tubes permanent or temporary?

These four questions can be bracketed. The position is under review at present. Very shortly you may expect some pronouncement by the Commonwealth Rubber Controlling Authorities *re* tyres and tubes. The present controlling measures are very probably temporary. For the time being, however, "Proper Authorities" and the others referred to could continue to forward release recommenations, in urgent cases, to the Director of Emergency Road Transport for consideration in conjunction with Commodities Control Section of Department of Supply and Shipping.

What action should be taken to obtain the release of motor vehicle spare parts from frozen stock?

At the present time and as stocks of spare parts become available, what are not required for Army purposes are distributed to wholesalers. Applicants should, therefore, apply in the ordinary way to the local distributor, who, if necessary, should apply to his wholesaler. It would be advisable to try out other local distributors or wholesalers if the usual channel is not productive of results.

What procedure is in operation with regard to having motor vehicle repairs effected? Are there priorities for repair work?

"Protected" repair shops have been instructed that absolute priority must be given to vehicles in Priority 1 to 6 (which include farm and agricultural machinery), and, that, if facilities are available, vehicles in the lower priorities can be attended to after dealing with any work on hand, or which comes into the shop, for the higher priority jobs.

Special attention is being given to meeting requirements. There has been a serious shortage of oxy-acetylene containers because of Services demands. In some areas electric arc welding has been developed, but finer work can only be done with the oxy-acetylene. We hope the shortage of containers for the latter will only be temporary.

INSECT PESTS.

Notes contributed by the Entomological branch.

Pests of Sweet Potatoes.

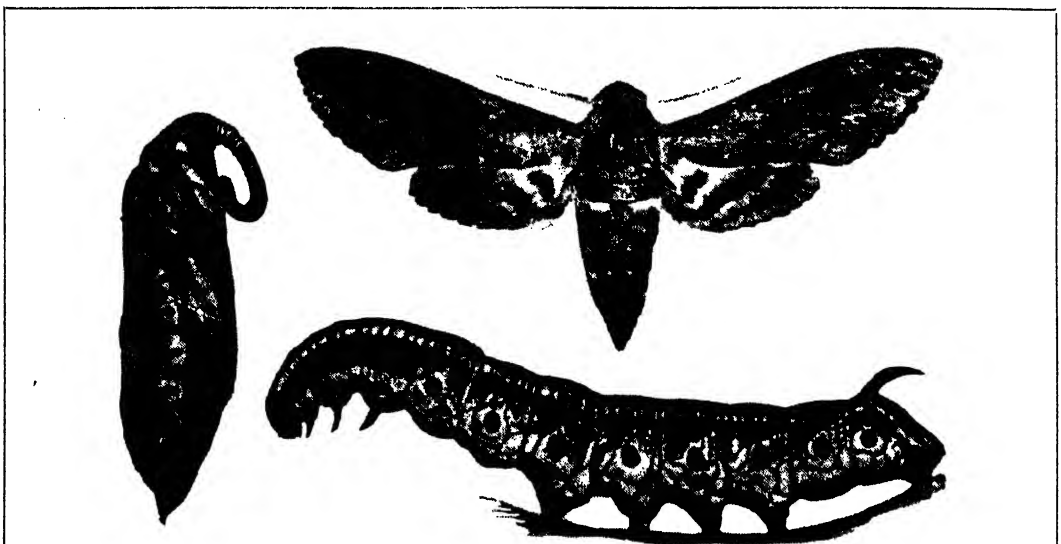
THE insects which in some seasons may occur in sufficient numbers to cause serious damage to sweet potatoes, include—The Convolvulus Hawk Moth (*Herse convolvuli*), **the Silver-stripe Hawk Moth** (*Hippotion celerio*), **two smaller species of Hawk moths, viz.,** *Hippotion scrofa* and *Theretra oldenlandiae*, **and the Sweet Potato Weevil** (*Cylas formicarius*). **Cutworms** (*Noctuidae*) **and flea beetles** (*Halticidae*) **may also cause injury to the plants and they may be attacked by the Red Spider** (*Tetranychus urticae*).

The Convolvulus Hawk Moth.

The caterpillars or larvae of this moth, which is an introduced species, feed on the foliage of sweet potatoes, convolvulus and other plants, and sometimes occur in sufficient numbers to cause considerable damage.

The egg, which is ovoid in form, is smooth and shining, and bright bluish-green in colour. It measures about 1-25th inch in length. The eggs are usually laid singly on the food plants, and the young caterpillars on emerging first eat their egg-shells, and after resting on the underside of a leaf commence feeding on it.

The caterpillar, when at rest, usually stretches out its body and turns its head somewhat downwards beneath the first two or three segments of its body. It strikes sideways with its head if molested. The colour of the caterpillars may vary from brown to bright green. In the dark or brown form there is a series of black spots along each side of the body, in the centre of each of which is situated a breathing pore or spiracle, and oblique darker stripes on the



Larva, Pupa and Adult of Convolvulus Hawk Moth.

body segments. The horn or spine at the end of the body, which is characteristic of most hawk moth caterpillars, is, in this species, curved and in the dark form black.

In the green form the body is grass-green and the oblique body stripes are pale-yellow edged above with violet. The curved spine is orange and tipped with black. The breathing pores are orange red, narrowly edged with dark-green.

When fully fed the caterpillar, which may then measure about 3½ inches in length, leaves the food plant and makes its way to the ground. It burrows into the earth, in which it forms an ovoid pupal cell, 2 to 4 inches underground, and within this cell changes to a pupa or chrysalis.

The pupa or chrysalis, which measures about 2¼ inches in length, is of a general brown colour, and the tongue (of the adult to be) is enclosed in a sheath which curves backward beneath the body from the head.

The adult moth, which measures about 3½ inches across the outspread wings, is of a general dark grey, speckled with whitish scales. The abdomen bears a central greyish stripe, and on each side of this the segments are marked with pink and black. The moth is a swift flier and usually appears at dusk. It may be seen hovering on the wing about various tubular flowers and inserting its extremely long tongue into them to obtain the nectar. The tongue measures about 5 inches in length.

There are at least two broods during summer, and the winter is passed in the pupal stage in the soil.

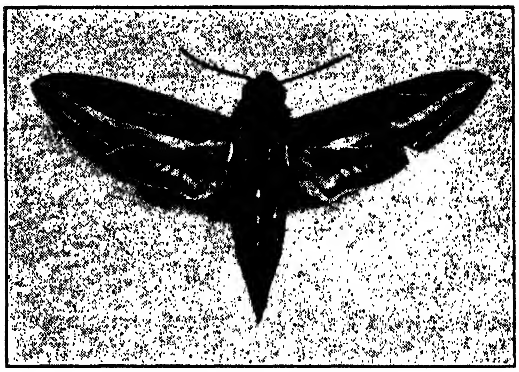
The Silver-Stripe Hawk Moth.

The caterpillars of this hawk moth, which is also an introduced insect, feed upon various species of plants as well as sweet potatoes. In many countries this moth is known as the Sweet Potato Hawk Moth on account of the damage it causes to these plants.

The bright-green eggs, which are laid on the food-plant, are broadly ovoid, smooth and shining. Two colour forms of the caterpillar are found, one being bright-green and the other brown. The caterpillar may be distinguished from that of the previously described species by the large oval eye-spot on the fourth body segment and a smaller yellowish spot on the fifth segment. The spine or horn at the end of the body is straight and tapers to a point and is mostly black.

During the day the caterpillar usually hides amongst the leaves near the ground. When fully fed, the larva, which then measures about 2½ inches in length, enters the ground to form an ovoid cell, within which it changes into its pupal or chrysalis stage. The pupa measures about 2 inches in length, and is of a general yellowish-brown colour, with darker brown markings and small black dots over the wing cases, legs and antennae. The tongue sheath is closely attached to the body.

The moth measures about 2½ to 3 inches across the outspread wings. The general body colour is light brown with small silvery markings. The forewings are brown and have a silvery stripe or band which extends from the wing tips to the inner margin of the wing. There are also smaller



The Silver-stripe Hawk Moth.

silvery markings. The hind wing is mostly brown, with a black central patch, and is bright pink near the body.

Two Smaller Hawk Moths.

The more numerous of the two smaller hawk moths, *Hippotion scrofa,* which may attack sweet potatoes, has dull brownish-grey forewings, often with lighter crescent-shaped markings, and orange-brown hind wings.

The other species, *Theretra oldenlandiae,* is somewhat similarly marked to the Silver-stripe Hawk Moth, but it is smaller, the stripe on the forewings is yellowish-grey, and the hindwings have not the bright pink areas.

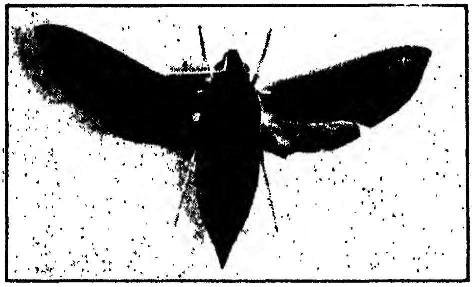
Control of Moth Caterpillars.

Where the caterpillars occur in sufficient numbers to render control measures necessary, spraying with arsenate of lead at the

rate of 2 oz. to 4 gallons of water; or dusting with a 10 per cent. arsenate of lead dust (lead arsenate powder 1 lb., kaolin 9 lb.) is recommended.

The Sweet Potato Weevil.

This weevil has a wide range throughout the world, and at times it is a pest of sweet potatoes on the North Coast of this State. It is known to feed on a number of other plants related to the sweet potato. The main damage is caused by the larvae or grubs, which feed in the tubers both in the field



One of the Smaller Hawk Moths.
(Hippotion scrofa.)

and during storage. The adults feed to a lesser extent on the tubers, but may also feed upon the stems and leaves of the plants.

The minute eggs are laid in the stems or tubers of the plant, and from these hatch legless grubs, which, when fully-fed, measure up to ⅜ inch in length. They are white, with light brownish heads and darker jaws, and are covered with minute pubescence. These grubs tunnel through the stems and tubers, reducing the latter to a decaying mass.

The grubs pass into their pupal or chrysalis stage in an oval chamber within the tuber. The pupa is elongate and measures about one-fifth inch in length. It is white and at the end of the abdomen there is a pair of large curved processes.

The adult is winged and it is evident from observations made in America(*) that they are much stronger fliers, and fly more readily than was previously believed. The adults were collected at lights, and were found at distances up to a mile from a given point of dispersal. The males were found to fly more freely than the females.

* Bull. Louisiana Agric. Exp. Stn. No. 323.

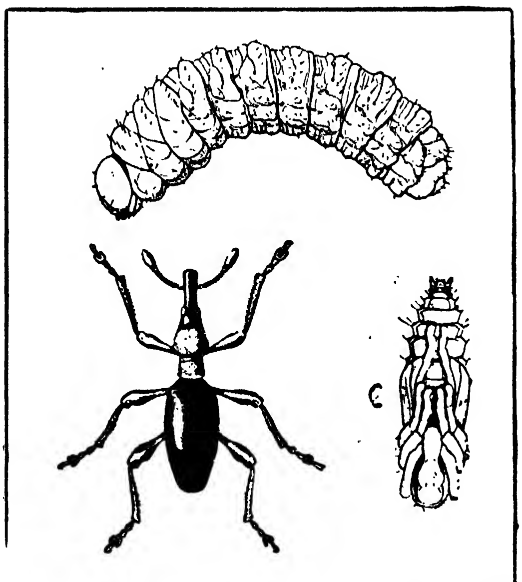
The adult measures about ¼ inch in length and is ant-like in general appearance. It has dark metallic-blue wing covers, red thorax and legs and a black head.

In warm weather the life-cycle from egg to adult may only occupy about thirty days. The weevils continue to breed during the winter months, but cold weather greatly retards their activities.

Weevil Control.

Where the adult weevils are feeding on the leaves or stems, spraying with arsenate of lead mixed at the rate of 2 oz. of arsenate of lead powder to 4 gallons of water, and dipping the tops of the plants in the arsenate of lead spray mixture when planting out, are recommended. Dusting with a 20 per cent. arsenate of lead dust (arsenate of lead powder 2 lb., kaolin 8 lb.) will also control them.

The spread of the pest is largely caused by transportation of infested tubers or plants. Growers, therefore, should obtain tubers for propagating purposes from localities known to be free from infestation.



Larva, Adult and Pupa of the Sweet Potato Weevil.

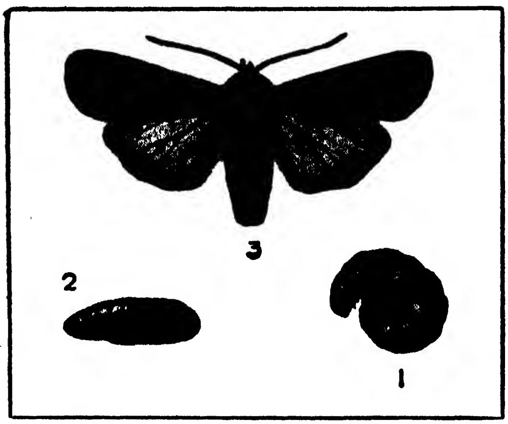
The pest over-winters mainly in tubers or stems which have been left in the ground after harvesting or in "volunteer" plants, and therefore, clean cultivation between crops, burning or boiling of all infested tubers and dead vines, careful harvesting

so that no tubers remain in the soil, and a regular rotation of crops are the chief control measures.

Weevils are often carried over the winter in the seed-bed, which should, therefore, be located as far as possible from where the main crop is to be planted, and the tubers used should be destroyed as soon as the young vines are obtained. When sweet potatoes are grown year after year in the same ground the weevil infestation becomes increasingly severe each succeeding year. Infested tubers which are not completely destroyed may be utilised as pig feed after they have been boiled.

Cutworms.

CUTWORMS are the larvae of several species of moths. They are usually dull-coloured caterpillars, which mostly feed at night and hide in the soil during the day. They



1.—Cutworm (or larva). 2.—Pupa. 3.—Moth.

feed upon a wide variety of weeds, in addition to cultivated crops, and when fully fed measure about $1\frac{1}{2}$ inch in length.

Any ground that has been cleared should be baited after an interval of several days, with a poison bait as a precautionary measure, *before planting out.*

The poison bait may be prepared according to the following formula:—

Bran	24 lb.
Paris green	1 lb.
Salt	8 oz.
Water	$2\frac{1}{2}$ gallons.

White arsenic or arsenite of soda (9 oz.) may be substituted for Paris green, but the bait is then much less attractive and effective. To prepare the bait the bran and Paris green (or white arsenic) should be thoroughly mixed while dry, and then made into a damp, crumbly mash with the water in which the salt has been dissolved. If arsenite of soda is used it should be dissolved in the water before mixing with the bran. The bait should be broadcast over the area, preferably late in the afternoon, at the rate of 50 lb. per acre. Where the plants become infested later the bait may be broadcast throughout the infested areas.

Flea Beetles.

THE flea beetles constitute a group of mostly very small species of plant-eating beetles, in which the femora or thighs of the hind legs are thickened and adapted for leaping. They gnaw small, irregular holes in the leaves of various plants, and at times where they occur in considerable numbers the leaves may become completely riddled. The young developing leaves and buds are often attacked, and when this happens the holes increase in size as growth takes place.

Control.

Spraying or dusting with arsenate of lead as recommended for the control of the sweet potato weevil will also control these pests.

Red Spider.

THE common red spider is a small mite which has a wide range of host plants. It may cause serious injury during dry weather. These mites occur mainly on the underside of the leaves where they both feed and spin fine webs. Where the infestation is severe the leaves become mottled in appearance and may turn yellow.

Control.

They may be controlled by dusting with a mixture of fine sulphur (2 lb.) and hydrated lime (1 lb.). A lime-sulphur spray (1 in 100) diluted at the rate of $6\frac{1}{2}$ fluid oz. concentrated lime-sulphur solution to 4 gallons of water will also control them.

Clean cultivation is also a factor in their control.

Parliament Discusses

Items of Interest to Primary Producers.

REPLYING to a question asked in Parliament as to shortage of seed of vegetable crops, the Minister for Agriculture and Forests (Hon. W. F. Dunn) said:—

"It is a fact that there is a serious shortage of seed for vegetable crops. Shortly after war broke out my Department realised that as we depended almost entirely upon imported seed, it was necessary to make some arrangements for the local production of seed. Action on a Commonwealth basis was necessary, and representations were made to the Commonwealth Government in regard to action that should be taken. Action was taken by the Commonwealth Government, and a Vegetable Seeds Committee was established, of which an officer of my Department was a member. I understand that funds were made available to that Committee, mainly for the purpose of encouraging production by private growers and for the purchase of seed. Recently the Committee was reorganised and my Department is not now represented on the Committee.

"To assist as far as possible, my Department gave precedence to vegetable seed production at its experiment farms where seed can be produced. The Leeton Experiment Farm is now almost entirely devoted to the work of seed production, and this is also one of the main features at the Bathurst Experiment Farm. Recently the Treasurer provided additional funds in order that up to 150 acres can be sown with vegetable seed crops at the Leeton Experiment Farm. A proposal was also submitted by my Department to the Commonwealth authorities for large-scale production on behalf of the Commonwealth in the Bathurst district, but I regret to say that the Commonwealth authorities have not seen fit to adopt our proposals. However, I have arranged that the work at Bathurst Experiment Farm will be still further extended.

"In addition to the above action, a field officer has been allocated solely to the work of encouraging vegetable seed production by private growers."

Price of Millet.

LAST month the Minister for Agriculture and Forests was asked, in Parliament, whether it was a fact that the Commonwealth Prices Commissioner had fixed the price of first-class millet at £55 a ton, whereas the present price was £80 a ton. In view of the injustice done to producers by fixing a price almost one-third less than the market price, the Minister was asked if he would approach the Federal Government with a request to have the matter reviewed and a price fixed more in keeping with that ruling on the open market.

The Minister (Mr. Dunn), said he believed that the prices mentioned above were correct, but pointed out that the matter was entirely a Federal concern. However, he would be happy to make representations to the Federal Minister concerned along the lines suggested.

In Favour of Better Price for Citrus.

ASKED as to whether it was a fact that the Federal Government proposed again to freeze a considerable percentage of this season's citrus fruits, including up to 100 per cent. of one variety, for juices for the forces, the Minister for Agriculture and Forests (Mr. Dunn) said that he believed it was a fact that the Federal Government proposed again to take a certain percentage of citrus fruits for the use of the troops, and that the price would be decided by the Prices Commissioner. The Department of Agriculture, continued the Minister, had

(*Continued on page* 164.)

The Harvesting of Late Maturing Apples.

DURING this month harvesting of late maturing apples, such as Granny Smith, Democrat and Yates, will be continued in the late districts of this State. Provided the fruit is suitable, much of it will be placed in cold storage for marketing late in the year—from October to the middle of December, with the marketing period of a few odd lines extending to late December and early January.

From picking period to consumer, apples will be held for some considerable time in cold storage, and it is, therefore, essential not only to see that the right sizes and varieties are selected for storage, but that the fruit is handled carefully. Much wastage occurs through the careless handling of fruit, being brought about by skin abrasions and skin punctures which allow common rot organisms to enter the fruit, and quickly cause decomposition of those attacked. This, of course, will bring about the decay of neighbouring fruits in the case.

The following should be carefully noted by those engaged in harvesting and preparation of fruit for market:—

1. Fruit pickers should keep their nails trimmed short.
2. Do not over-fill picking bags.
3. If picking from a ladder, work from the top of the tree downwards.
4. Do not lean on a picking bag which contains fruit, or press the bag against the ladder.
5. Place the fruit in the picking bags; do not drop them in.
6. Cases should be kept free from grit or any matter likely to injure the skin of the fruit.
7. Picking bags should be kept free from foreign matter.
8. When carting fruit to packing shed, see that the cases are not over-full and that the case on top is not resting on fruit in the case below.
9. Keep the parts of the sizing machine clean, particularly those parts with which the fruit makes contact.
10. Bruises and punctures are often caused by a sharp drop from roller to bin. This should be avoided.
11. Excess of lubricating oil is frequently found on the sizing machine. The oil becomes black on account of its job and so does the fruit that comes in contact with it.
12. Do not turn your lidding press into a cider press. Get the fruit right before nailing up.
13. Remember you are handling other people's food.—S. W. FERGUSON, Fruit Inspector.

The Sterilisation of Fruit Cases.

Now that fruit cases are costly and often in short supply, many thousands of them are being used more than once for the marketing of fruit. This has focussed attention on the very direct bearing that the condition of such cases has on the distribution of pests and diseases as well as the storage life of the fruit carried in them.

Not only may infested cases be the means of spreading insect pests such as codling moth, etc., throughout orchards, but infected cases may be a prolific source of the various fungal rots.

It would seem that the time has come when more attention could profitably be given to the sterilisation of cases, particularly by cool stores, packing houses and canneries, etc., which deal in large quantities.

A simple and expeditious method of steam sterilisation of cases in quantity has been evolved by officers of the Council for Scientific and Industrial Research. The plant required is simple and would require only a very moderate outlay. Any organisation or grower who is interested is invited to apply to the Department of Agriculture, Box 36A, G.P.O., Sydney, as soon as possible, for full particulars.—E. C. WHITTAKER, Fruit Packing Instructor.

Sulphate of Ammonia for Rice Growers.

A QUANTITY of sulphate of ammonia will be made available to ricegrowers for use on the 1943-44 crop. Applications for supplies should be made to fertiliser agents and storekeepers prior to 31st May. Late applications will not be considered.

As stocks are limited it will only be possible to make the fertiliser available to those requiring it for old rice land, and allocations will be made by the Senior Agricultural Instructor, Leeton.—A. W. S. MOODIE, Fertiliser Rationing Officer.

Parliament Discusses Items of Interest to Primary Producers.

(*Continued from page* 163.)

already urged, because of representations made by citrus fruit interests and growers' organisations, the Minister for Commerce to increase the price this year to ensure that the grower received more than the cost of production for the whole of his crop. He was hopeful, said the Minister, that as a result of the representations already made and those which would now be made on behalf of the questioner, a more satisfactory price would be paid for this season's fruit.

Wintering on a Sunny Hillside.

Beekeeping Hints.

W. A. GOODACRE, Senior Apiary Instructor.

An Example of Successful Community Life.

EVERY aspect of the life of the honey bee is of very great interest to the bee-keeper, but there is a special appeal about the study of the community life, and what, for want of a better term, may be called the "economic" life of this insect. In this study we observe a general characteristic in all the work of the field force of bees, which, if it were displayed by humans, could be described as "outstanding unselfishness and devotion to the interests of the community."

At the moment we are particularly interested in the wintering of colonies, and the way in which the bees make the most of their stored food supply so that it will tide them over the cold weather until spring conditions enable a renewal of progressive work in the fields. As there are no loafers amongst the working force, no time has been wasted in building up stores of food for winter needs, and it will be seen that no problems of foods distribution arise.

Each worker bee may be depended on to consume no more than a fair ration, and the colony appears to practise "rigid economy" when necessary. This aspect of bee-life was well illustrated in a recent case in which bees were found in such weakened condition from starvation that scarcely any movement amongst them could be observed; even at this stage the bee-farmer was successful in reviving practically the full colony, including the queen. Sugar-syrup was lightly sprayed on the starving bees to revive them, as they were too weak to take food from a feeder. The fact that practically all of the bees became weakened to the same degree simultaneously through starvation showed that all had shared equally the available honey store in the hive, or the meagre quantity being brought in from the fields, before the strength of the bees gave out.

The Bees' Preparations for Winter.

With the object of making their store of winter food last as long as possible, the colonies, with the approach of cold weather which limits field activity, will take steps to reduce or close those non-essential avenues through which food may be used. A good deal of honey is used in brood-rearing, therefore, the brood of the colony

requires to be gradually reduced until, in the cooler climates, it covers no more than a mere patch on a comb. Drone bees consume a fair amount of food and serve no useful purpose during winter, so the workers exterminate them. The bees themselves

Ample Stores for Winter Prevent Undue Hardship.

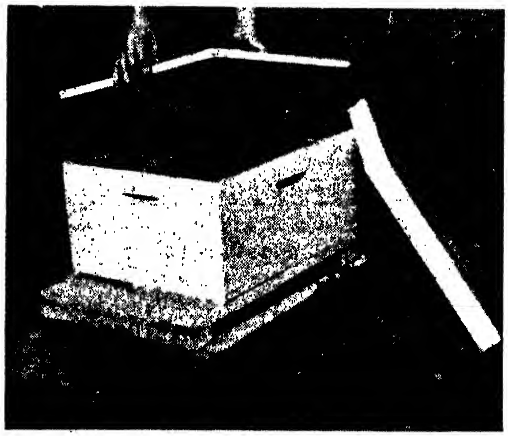
will pack in closer together so that they will be warmer and need less food to keep up the temperature required by the winter cluster. Then the whole cluster will gradually settle down into a semi-hibernating condition so that the bees may fully conserve their vitality and use as little food as possible.

There is no set time for the bees to commence these seasonal "economies," as much depends upon weather conditions; *e.g.*, it may be an early or a late winter. Then, again, in warm climates, and where the colony is enabled to carry on with progressive field work, only a limited need exists for these preparations for winter. It is remarkable how the bees adapt themselves to the varied climatic and other conditions. In the majority of districts, however, it is necessary for the colonies to conserve their energy during the winter, and the bee-farmer should endeavour to give full co-operation by providing comfortable quarters for his bees, and ensuring that they have an adequate supply of food, as recommended in the March issue.

Early Spring Work.

With the advent of spring the colonies will again go ahead with progressive field work, mainly for the purpose of gathering supplies of nectar and pollen, particularly the latter which is necessary for brood rearing. Brood must be established to produce a force of young bees needed to replace the old ones carried through winter. In consequence, the colonies will use the stored food supply for brood-rearing more freely during early spring than at any other time.

The bee-farmer should never allow his colonies to run short of stores during spring as, during adverse conditions, the bees may be forced to reduce brood-rearing, particularly should it come to the point of living "hand-to-mouth." On the other hand, he should keep them in good heart by timely stimulative feeding, or by providing combs of honey secured from other hives which have been reserved for the purpose.



Winter Protection to Conserve Vitality and Stores.

The Bee-farmer Must Co-operate.

From a broad study of these matters we see that the normal measures adopted by bees, which we know to be essential for successful wintering, should be encouraged, and care taken to avoid such conditions as shortage of stores or the like, which would cause the colonies unnecessary difficulties.

Planting Eucalypts.

Late Winter or Early Spring Preferred.

All bee-keepers should be interested in the planting of our Eucalyptus species. In many inland localities it should make quite

a difference to plant a hundred or two of Yellow Box trees for honey, or other species for pollen production, to fill up gaps now so noticeable in our native flora; on the coast the planting of ironbark trees to replace those cut for milling timber is well worth keeping in mind.

A number of apiarists have land on which planting could be carried out, and in other cases it may not be difficult to obtain permission to plant on private holdings or Crown reserves in selected places.

Many farmers and graziers are now becoming "tree conscious," the spectacular and serious damage that has resulted in many districts from soil erosion having made them realise the seriousness of ruthless destruction of tree growth. It may be said that there is definite move toward the planting of trees to prevent both water and wind erosion. No definite time is set down for planting out Eucalypts, but the best time is during the late winter or early spring.

Object Lessons in Tree-preservation and Planting.

Object lessons in tree-preservation and planting are given at the Wagga Experiment Farm, Wagga, and in the Hunter River district, by Mr. Sam Parish. At the Wagga Farm, not only has special care been taken to preserve all useful naturally well-grown Eucalypts wherever it has been economically possible, but in addition a good deal of valuable tree-planting work has been accomplished. In all cases, however, whether the main object was to prevent soil erosion or to make provision for a wood lot, the trees of most value for honey production were given preference in the reservation or selection for planting. The picturesque mature Yellow Box trees reserved on the Farm are something we may well be proud of, whilst the planting of good numbers of Pepper trees, Tree Lucerne, Sugar Gums, Wattles, and Box trees, all of value to bees, has proved an outstanding success. The high average production (approximately three 60 lb. tins of honey per productive hive per annum over the past four years under trying conditions) is due mainly to reservation and planting of trees. The Pepper trees, Tree Lucerne, and Wattles greatly assist in providing pollen during any Yellow Box flow (this species flowers early in the season at Wagga), and during any failure of the Yellow Box they assist in keeping the bees in good heart, each one proving its value. The Sugar Gums prove very useful, as they commence to flower late in November, just about the time the flowering of the Yellow Box is finished.

A Corner of the Wagga Experiment Farm Apiary.

Young Yellow Box Trees in the background; large Sugar Gum in the foreground; and the commencement of a long hedge of Tree Lucerne on the right.

Mr. Sam Parish, near Hinton, on the Hunter River, has planted about 800 hardwood trees, mainly Eucalypts, on his

(Continued on page 196.)

Prune Varieties from United States of America.

Their Commercial Possibilities.

K. D. McGILLIVRAY, H.D.A., Orchardist, Wagga Experiment Farm.

IN the search for better varieties of fruit the horticulturist finds some material for his work in varieties which have become established in other countries. Before the introduced variety can replace the local favourite, however, there must be proof that it is undoubtedly a better variety—better from the point of view of the grower and of the consumer, and certain to bring increased satisfaction to both parties.

The Division of Horticulture has had prune varieties from the United States of America under trial for some years at the Experiment Farms. Work of this nature takes time and the number of successes is not great. However, it is now becoming possible to survey the observations made over the years.

The following notes describe* the varieties and summarise the knowledge gained to date of those field habits and commercial qualities which are likely to provide the answers to the questions: "Can this prune or that prune take the place of varieties now in commercial production?"

Stanley.

Description—

Shape: Size large; long, oval, tapering slightly to base and apex.

Colour: Very dark purple, almost black when fully mature.

Bloom: Heavy and blue.

Stalk: Medium length, medium thickness.

Stalk cavity: Small, narrow.

Suture: Moderately broad, base to apex; broad prominent ridge, base to apex; one side of suture forms a humped vertical shoulder at the apex.

Flesh: Moderately firm texture, colour golden with slight tinge of green; semi-clingstone.

Pit: Medium to large size, medium wide, plump. Ventral ridge wide and prominent; many show moderately numerous small grooves which end in basal pits.

Tree of the Stanley Prune.

* In the following descriptions the term "ventral" refers to the edge which carries the suture and "dorsal" to the opposite edge.

Dorsal ridge moderately prominent; channel deep and moderately wide base almost to apex, sides of dorsal channel pierced by small pits, usually in the portion from the middle towards the apex. Apex rounded with a small but distinct point. Base narrow, sloping and grooved.

Observations.—This variety is one of the disappointments. The fruit is large and regular in shape and produces a large prune which is attractive in appearance and of excellent flavour and quality. After receiving the standard cold wet sweat and steaming treatment the resulting dessert

Stanley Prunes.

Tree of Imperial Prune.

prune comes out of the can in splendid eating condition.

Against these good points, however, the skin is tender, the drying ratio high and there is a fairly high proportion of twin fruits. The outstanding fault is that the tree lacks vigour. The habit of growth is open and spreading, the foliage scanty and the limbs are liable to sunscald. Trees of this variety reach maturity ahead of other varieties under trial and, in the early years of cropping produced a greater weight per tree of dried fruit than any other. The position now is that d'Agen trees of the same age are much bigger and producing more than twice the weight of crop.

Imperial.

Description.

Shape: Size large; broad oval, base rounded, apex broad.

Colour: Red on yellow ground, changing to reddish purple when fully mature.

Bloom: Light and blue.

Stalk: Short to medium length, medium thickness.

Stalk cavity: Medium wide, medium to deep, sometimes slightly raised around cavity.

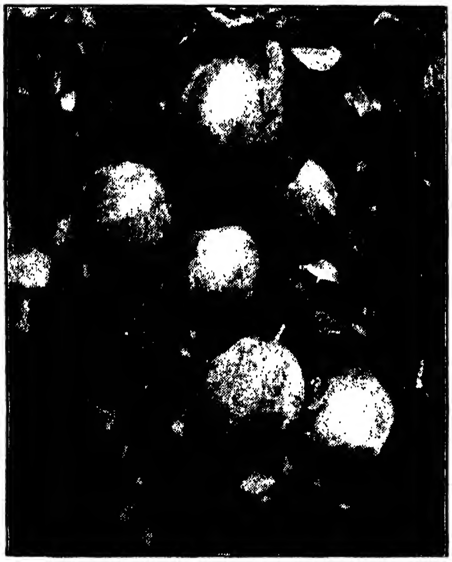
Suture: Clearly defined base to apex, prominent ridge base to apex on one side of suture.

Flesh: Texture fine and soft, colour golden.

Pit: Semi-clingstone; size small to medium, moderately broad, medium plump, medium rough. Ventral ridge is wide and prominent and carries a small but distinct wing on its basal shoulder; clearly cut grooves usually extend from the base to near apex. Dorsal ridge is distinct; wide, moderately shallow channel base to near apex. Apex rounded. Base tapers gently and is lightly ridged.

Observations.—Another attractive importation which has not proved suitable for inclusion in the front rank. There is no doubt that the consumer would ask for more

of this prune, its qualities of flavour and texture which make for good eating being very fine, probably superior to most other varieties.



Imperial Prunes.

The worst of a number of faults which this prune shows, is that it is extremely difficult to handle. Even in very skilful hands there would be some loss and much trouble in the harvesting, dipping and drying of a crop of this soft tender-skinned fruit.

The drying ratio is higher than Robe, and the trees are smaller and less vigorous than d'Agen, the crop being little more than half that of d'Agen.

Wagga Experiment Farm Data Relating to Prune Varieties from U.S.A.

Variety.	Blossoming Date.	Harvesting Date.	Number per lb. dried.	Drying ratio.	Percentage stone to flesh.	Crops (d'Agen 100.)
Stanley ...	8 Sept.	15 Feb.	45	1–3·2	5·6	42
Imperial....	9 ,,	8 ,,	47	1–3·5	5·6	65
Standard...	11 ,,	9 ,,	60	1–3·5	7·5	...
Coates ...	9 ,,	12 ,,	65	1–2·2	7·6	92·5
French Improved	10 ,,	19 ,,	70	1–2·1	8·3	100
Burton ...	8 ,,	12 ,,	71	1–2·0	9·3	85
d'Agen ...	9 ,,	8 ,,	76	1–2·0	7·5	100
Robe ...	6 ,,	28 ,,	70	1–2·5	9·6	95

Standard.

Description.—

Shape: Size large; long regularly curved oval, only slightly flattened at apex.

Colour: Very dark purple.

Bloom: Moderately heavy and blue.

Stalk: Very short, stout.

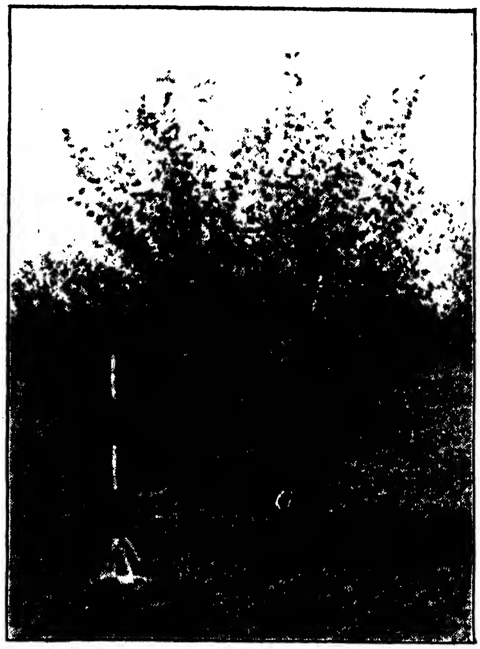
Stalk cavity: Wide and deep, fairly deeply indented by suture.

Suture: Shallow, lightly defined except at base.

Flesh: Colour golden, texture firm.

Pit: Freestone; medium to large size, moderately broad, moderately plump. Ventral ridge wide and prominent, usually deeply grooved towards base and apex with several pits in the middle portion. Dorsal ridge prominent and deeply channeled near base and apex, the channel in the middle portion being covered; the dorsal ridge resembles Robe but pits in the middle are absent and the channel near the apex is much more definite. Apex rounded. Base fairly wide and lightly grooved.

Observations.—A corrective has not been found yet to the pronounced, dwarfed habit of growth which seems to be characteristic of this variety. The trouble starts in the nursery; various methods of propagation, including root grafting have been tried, and a comprehensive assortment of stocks—Myrobolan, Marianna, peach and a strong growing plum stock—have all failed to put vigour into this weak grower.



d'Agen Prune Tree on Same Stock as the Imported Varieties.

The tree grows in a peculiar manner. The leaders often become stunted and strong growths arise from lower positions on the limbs. In many cases the wood takes on a twisted appearance. The tree does not even attain reasonable proportions, and a height of 6 to 7 feet at ten years would be regarded as good size for Standard.

Standard Prunes.

The prune is large and looks and tastes extremely well; the drying radio is high and the crop ripens later than d'Agen.

Coates.

Description.—
- Shape: Size medium and of d'Agen type; long oval, often narrowing sharply to base; apex moderately rounded.
- Colour: Deep yellow on greenish yellow ground.
- Bloom: Medium and blue.
- Stalk: Variable length, usually moderately long.
- Stalk cavity: Medium large and medium deep.
- Suture: Base to apex, not prominent, sutural crease at style.
- Flesh: Firm texture, not coarse, golden colour slightly tinged with green throughout.
- Pit: May be clingstone or semi-clingstone; size small to medium, medium width, thin to medium plump, medium rough. Ventral ridge wide and prominent. Dorsal ridge distinct, deeply channeled base to apex. Apex rounded, base grooved.

Observations.—Coates is a similar type to d'Agen and resembles it closely in such characters as texture of flesh, type of skin, &c. This prune, like d'Agen, is easy to handle and consequently the same amount of latitude in all operations connected with harvesting and drying is permissible.

Coates has a slightly richer flavour than d'Agen, and at Wagga has consistently been of larger size. As a result of processing trials in which all varieties received the same treatments, it was found that its quality as a stewing prune or canned for dessert compared favourably with d'Agen

A tendency towards alternate cropping has been recorded, but this fault does not seem to be exhibited to a serious extent. Like d'Agen, this variety is self fertile; the average of dried fruit per tree has been a little below d'Agen.

Burton.

Description.—
- Shape: Small to medium size, d'Agen type; long oval, narrowing sharply at base, often forming a slight but distinct neck.
- Colour: Purplish red, dark purple at full maturity.
- Bloom: Medium and blue.
- Stalk: Medium to long, medium thickness.
- Stalk cavity: Usually deeper and wider than d'Agen.
- Suture: Base to apex, not always distinct, suture crease at style.
- Flesh: Firm texture, light golden colour.
- Pit: Freestone; size small to medium, mostly small; medium width, thin to medium plump; smooth to slightly rough. Ventral ridge not prominent. Dorsal ridge clearly defined, wide moderate channel which is uninterrupted from base to near apex. Apex usually regularly rounded, small point. Base gently tapered.

Tree of Coates Prune.

Observations.—The fruit of this variety is d'Agen type, but has no outstanding qualities which would recommend it in preference to d'Agen.

Of the varieties similar to d'Agen which have been under trial, this one has produced the lightest crops and has shown a tendency towards alternate bearing.

More recent Wagga records place Burton in about the same average size grade as d'Agen, but earlier records from Wagga and those from plots elsewhere describe it as smaller than d'Agen.

French Improved.

Description.—

Shape: Size medium and of d'Agen type; long oval, narrowing gently at base.

Colour: Dark purple when fully mature.

Bloom: Medium and blue.

Stalk: Length variable, moderate thickness.

Stalk cavity: Small and shallow.

Suture: Clearly defined base to apex; moderately prominent ridge on one side of suture which increases in prominence towards the apex where it forms a distinct hump; sutural crease at style. The last mentioned character is present in d'Agen and other d'Agen types to a slight extent, but is more marked in this variety.

Flesh: Firm texture, light golden colour.

Pit: Freestone; small to medium size, medium narrow, medium plump, rough. Ventral ridge medium prominent. Dorsal ridge channeled base to apex, tendency to square shoulder at apex. Well defined, radiating grooves at base, which usually tapers to a narrow extremity.

Observations.—French Improved is very much like d'Agen. Trees of this variety at Wagga have consistently produced crops which were quite equal in weight to d'Agen and the fruit is always larger, being similar to Coates in this regard.

It has been noted that French Improved matures its crop later than d'Agen and that it is satisfactorily self-fertile. Stewing and dessert qualities are quite equal to d'Agen.

Summary.

Of these imported prune varieties two only, viz., *Coates* and *French Improved*, show promise of being worthy of further consideration. Those which failed when compared with established varieties and the main reasons for such failure are:—

Stanley.—Weak, spreading tree, only half the crop of d'Agen.

Imperial.—Extremely soft, difficult prune to handle.

Standard.—Dwarfed, distorted growth on all stocks used.

Burton.—Smaller fruit and smaller crop than d'Agen.

Sulphate of Ammonia for Oranges Under Irrigation.

FROM the limited supplies of sulphate of ammonia available for agricultural purposes it has been possible to allocate a quantity for use on oranges grown under irrigation.

To secure rations growers should apply to their usual supplier prior to 31st May; late applications will not be considered. The grower must supply information regarding his area of producing trees, as the distribution will be restricted to an amount sufficient to meet the requirements of such trees. Application forms are obtainable from fertiliser distributors on the principal irrigation areas; irrigationists at other centres may obtain such forms from the Department of Agriculture.

Suppliers will be notified regarding the quantity of sulphate of ammonia allotted to each grower, who will then complete arrangements regarding delivery which must be taken by 31st October.

It is regretted that other citrus growers will be unable to participate in this distribution, but it is probable that the needs of these growers for a quick acting nitrogenous fertiliser will be met by the liberation of a supply of nitrate of soda at an early date. In the meantime they are able to secure blood and bone, and limited supplies of nitrate of soda under existing rationing arrangements.—A. W. S. MOODIE, Fertiliser Rationing Officer.

No Winter School for Farmers.

IN view of the conditions resulting from the war, no winter school is to be held at Hawkesbury Agricultural College this year. Shortage of labour on farms has had the effect of reducing the number of applications for enrolment for these popular courses of instruction, and the serious depletion of the Department's instructional and other staff and the strict need for economy, have been further reasons for the decision again to allow the school to lapse. Similar consideration precluded the holding of the school last year.

Effect of Stocks on Citrus Fruit Quality.

Trials With Navels, Valencias and Marsh Grapefruit.

E. G. HALL, B.Sc.Agr., Fruit Research Officer.

CHEMICAL investigations to determine the effect of three different stocks, namely, rough lemon, sweet orange and *Citrus trifoliata* on the quality of Washington Navel and Valencia oranges and on Marsh grapefruit in three different parts of the State were carried out during 1940 and 1941. In spite of some minor inconsistencies the best quality fruit of Navels, Valencias and grapefruit came from trees on *Citrus trifoliata* stock, which was often highest in specific gravity and juice contents, was usually highest in acidity and was in nearly all cases highest in soluble solids in the juice and in flavour.

The work was carried out in the Food Preservation Laboratory at Homebush with fruit obtained from trees in the Departmental trials being conducted in three different parts of the State.

*Plan of Experiment.**

Districts.—Leeton Experiment Farm; Hawkesbury Agricultural College; Grafton Experiment Farm.

Varieties.—Washington Navel orange; Valencia orange; Marsh grapefruit.

Stocks.—Rough lemon; sweet orange; *Citrus trifoliata.*

Maturities.—Early, mid-season and late for each variety at each centre.

Determinations Made.

The following determinations were made:—

(*a*) Rind colour; (*b*) average weight of fruit; (*c*) specific gravity of whole fruit; (*d*) percentage of juice by weight—the fruit being hand reamed and the juice pressed through a double cheese cloth strainer and then weighed; (*e*) acidity—expressed as millilitres of tenth normal sodium hydroxide solution required to neutralise 10 millilitres of juice; (*f*) soluble solids in the juice, most of which is sugar—expressed as degrees Brix at 17.5 deg. C.; (*g*) ratio of soluble solids to acid—this ratio is widely used as a criterion of the maturity of the fruit; (*h*) palatability—separated into taste and flavour plus the degree of bitterness for grapefruit.

The Results Obtained.

Rind Colour.—There was a general tendency in 1940 for fruit from sweet orange stock to colour later than that from rough lemon and *trifoliata* stock, but there were no differences between stocks in 1941.

Specific Gravity of Whole Fruit.—This gives a useful estimate of quality, as it mainly depends on juice content and the amount of soluble solids in the juice. The specific gravity of fruit from Grafton was higher in both years than that from the other districts.

At Leeton in 1940 for all varieties, and in 1941 for Valencias, fruit from *trifoliata* stock had the highest specific gravity, and fruit from rough lemon the lowest; with Navels and grapefruit in 1941, the differences were not marked.

At Hawkesbury College in the case of Navels in 1940, sweet orange was lower

* Duplicate samples each of ten fruits, were examined. No Valencias were available from Leeton in 1940. From Hawkesbury Agricultural College only Navels and Valencias were obtained in 1941. No Navels on sweet orange stock were available from Grafton in either year.

than the other two, and in 1941 *trifoliata* was considerably higher than rough lemon and sweet orange. For Valencias in 1940, rough lemon was lower than the others.

the most juice; with Valencias rough lemon gave the most and *trifoliata* the least. In 1941 with Navels, *trifoliata* fruit had the most juice and rough lemon the least.

Average Specific Gravity of Whole Fruit.

District.	Year.	Washington Navel. Rough Lemon.	Washington Navel. Sweet Orange.	Washington Navel. Trifoliata.	Valencia. Rough Lemon.	Valencia. Sweet Orange.	Valencia. Trifoliata.	Grapefruit. Rough Lemon.	Grapefruit. Sweet Orange.	Grapefruit. Trifoliata.
Leeton	1940	0·832	0·855	0·875	...	...	...	0·709	0·717	0·743
	1941	0·868	0·870	0·875	0·890	0·891	0·920	0·695	0·678	0·695
Hawkesbury Agricultural College	1940	0·831	0·760	0·827	0·793	0·822	0·817	...	...	...
	1941	0·850	0·842	0·877	...	...	...	...	...	...
Grafton	1940	0·887	...	0·893	0·922	0·907	0·911	0·816	0·817	0·819
	1941	0·878	...	0·913	0·897	0·911	0·930	0·720	...	0·746

At Grafton in 1940, the differences were not marked in Navels and grapefruit, but with Valencias, rough lemon had the highest and sweet orange the lowest specific gravity. In 1941 *trifoliata* was the highest and rough lemon the lowest with all three varieties.

Juice Content.—The data for both years are summarised in the following table:—

At Grafton the differences for Navels and Valencias in 1940 were not significant, but with grapefruit there was most juice in fruit on sweet orange and least in fruit on rough lemon. In 1941 rough lemon was higher than *trifoliata* for Navels, *trifoliata* much higher than the others for Valencias and *trifoliata* more than rough lemon for grapefruit.

Average Juice Content. (Per cent.)

District.	Year.	Washington Navel. Rough Lemon.	Washington Navel. Sweet Orange.	Washington Navel. Trifoliata.	Valencia. Rough Lemon.	Valencia. Sweet Orange.	Valencia. Trifoliata.	Grapefruit. Rough Lemon.	Grapefruit. Sweet Orange.	Grapefruit. Trifoliata.
Leeton	1940	43·0	43·6	45·4	...	...	...	39·8	37·7	43·9
	1941	47·0	45·9	47·9	49·0	49·6	50·7	39·2	32·2	37·8
Hawkesbury Agricultural College	1940	43·0	38·5	39·7	41·7	40·5	37·0	...	...	...
	1941	42·5	40·7	43·9	...	...	...	...	...	...
Grafton	1940	49·5	...	49·3	54·7	54·8	55·1	47·8	50·3	48·7
	1941	48·8	...	46·7	45·7	45·1	50·1	42·3	...	44·3

In 1940 the juice content of fruit from Grafton was higher than that from other districts, and in both years fruit from Hawkesbury Agricultural College had less juice than fruit from the other districts.

The data for juice content were analysed statistically and the following significant differences were found:—

At Leeton in both years fruit from *trifoliata* stock had the highest juice content except in 1941, with grapefruit, when rough lemon gave the highest juice content. In 1940 sweet orange was not different from rough lemon in its effect on juice content, but in 1941, Navels and grapefruit on sweet orange had least juice.

At Hawkesbury Agricultural College in 1940 with Navels, rough lemon stock gave

Acidity.—The data for both years are summarised in the table on page 175.

The acidity of Navels was lower at all centres in 1941 than in 1940; Navels from Grafton generally were less acid than those from other districts. With Valencias and grapefruit, seasonal and district differences were not marked.

Statistical analysis of the data yielded the following information:—

At Leeton the differences between stocks were not significant in 1940. In 1941, Navels on *trifoliata* had most acid and sweet orange the least; with Valencias both sweet orange and *trifoliata* had more acid than rough lemon; while for grapefruit there were no significant differences.

At Hawkesbury Agricultural College in 1940, with Navels and Valencias, fruit from sweet orange had least acid and that from *trifoliata* had most acid. In 1941, Navels on sweet orange had more acid than Navels on rough lemon and *trifoliata*.

from Grafton), and in 1941, with only one exception, Navels from Hawkesbury), fruit from *trifoliata* stock had the highest soluble solids in the juice. In 1940 at Leeton and Grafton there was a general tendency for fruit from rough lemon stock to have the

Average Acidity. (Mls. N/10 NaOH per 10 mls. Juice.)

District.	Year.	Washington Navel.			Valencia.			Grapefruit.		
		Rough Lemon.	Sweet Orange.	Tri-foliata.	Rough Lemon.	Sweet Orange.	Tri-foliata.	Rough Lemon.	Sweet Orange.	Tri-foliata.
Leeton	1940	22·7	24·2	23·2	...	...	...	32·9	34·3	34·0
	1941	18·6	17·7	19·4	22·6	27·6	26·3	34·1	34·1	33·7
Hawkesbury Agricultural College	1940	22·9	21·1	24·3	30·1	27·5	34·8	...	...	...
	1941	13·6	10·9	13·4	...	...	...	...	...	...
Grafton	1940	16·9	...	19·0	26·7	29·6	27·1	30·4	28·4	29·0
	1941	9·7	...	16·3	24·9	29·2	32·5	28·2	...	28·6

At Grafton in both years, Navels on *trifoliata* were more acid than Navels on rough lemon. In 1940, Valencias on sweet orange had more acid than the others, and in 1941 for Valencias, *trifoliata* had more than sweet orange and both had more than rough lemon. For grapefruit in 1940, rough lemon was more acid than the others, while in 1941 the difference between rough lemon and *trifoliata* was not significant.

Soluble Solids in Juice (Brix value).—The data for both years are summarised in the following table:—

lowest soluble solids. In all cases in 1941, except Navels from Hawkesbury, fruit from rough lemon stock had much lower solubl solids than fruit from sweet orange and *trifoliata* stocks.

Ratio of Total Soluble Solids to Acid.—The most striking fact from the table showing ratio of total soluble solids to acid is that there was a big difference in the ratio between varieties; Navels were the highest and grapefruit the lowest. The ratio varied considerably between districts and between years.

Average Total Solids in Juice (degrees Brix).

District.	Year.	Washington Navel.			Valencia.			Grapefruit.		
		Rough Lemon.	Sweet Orange.	Tri foliata.	Rough Lemon.	Sweet Orange.	Tri-foliata.	Rough Lemon.	Sweet Orange.	Tri-foliata.
Leeton	1940	10·8	11·5	12·3	...	...	...	10·5	11·4	11·3
	1941	10·7	11·4	11·7	10·9	12·0	13·0	10·6	11·5	12·4
Hawkesbury Agricultural College	1940	13·8	11·4	15·2	12·0	11·9	12·7	...	...	...
	1941	11·2	11·7	11·0	...	...	...	...	...	...
Grafton	1940	10·7	...	11·5	11·7	12·7	11·6	9·7	9·6	10·5
	1941	9·8	...	11·9	12·0	13·0	13·2	7·7	...	8·8

The only marked district differences were that Navels from Hawkesbury College on rough lemon and *trifoliata*, had higher soluble solids in 1940 than similar fruit from other districts, and that grapefruit from Grafton had lower soluble solids than grapefruit from Leeton. Navels from Hawkesbury in 1940 had the unusually high value of 15 per cent. soluble solids in the juice. In 1940, with only one exception (Valencias

Navels from Leeton had lower ratios and were, as one would thus expect, generally more sour than Navels from Hawkesbury and Grafton, and in 1941 grapefruit from Grafton had lower ratios than that from Leeton. The effect of stock was variable, but with Navels from Hawkesbury and Valencias from Leeton, sweet orange was lowest, and with Navels at Grafton, *trifoliata* was lower than rough lemon.

Soluble Acids : Acid Ratio W/V.

District.	Year.	Washington Navel.			Valencia.			Grapefruit.		
		Rough Lemon.	Sweet Orange.	Tri-foliata.	Rough Lemon	Sweet Orange.	Tri-foliata.	Rough Lemon.	Sweet Orange.	Tri-foliata.
Leeton	1940	7·9	7·8	8·7	...	...	...	5·2	5·5	5·4
	1941	9·5	10·7	10·0	8·6	7·6	8·4	5·0	5·3	6·0
Hawkesbury Agricultural College	1940	9·9	8·8	10·8	6·5	7·1	6·0	...	...	...
	1941	14·0	11·5	13·6	...	...	...	...	...	...
Grafton	1940	10·3	...	9·9	7·2	7·0	7·0	5·2	5·5	5·9
	1941	16·7	...	12·0	8·1	7·4	6·5	4·4	...	5·0

Palatability.—Fruit from rough lemon stock was generally sweeter than that from sweet orange or *trifoliata* stocks at the early picking, but had less flavour, particularly at the late picking. There seemed to be a general tendency, except with Navels from Leeton, for fruit from rough lemon stock to reach palatable maturity earlier than fruit from other stocks, but fruit from *trifoliata* and sweet orange stocks held their palatability longer on the tree than fruit from rough lemon stock. Fruit from *trifoliata* stock generally had the best flavour and that from rough lemon the weakest. There is some evidence to suggest that fruit from sweet orange at Leeton is later maturing than fruit from the other stocks. In the case of grapefruit, fruit from *trifoliata* stock was markedly sweeter and less bitter than fruit from the other stocks, and fruit from sweet orange stock was generally most bitter and lost its bitterness more slowly.

Conclusions.

Two factors which have to be considered in drawing conclusions from these experiments are: Firstly, that fruit from trees on rough lemon stock appears to be earlier maturing and fruit from trees on sweet orange stock somewhat later maturing, than fruit from trees on *trifoliata* stock. Secondly, 1940 was a very dry year, and at Hawkesbury Agricultural College the trees were suffering from lack of moisture, blossoming was prolonged, and, therefore, particularly in the case of trees on *trifoliata* stock, the crop was variable in maturity. Thus the results for Hawkesbury fruit in 1940 should be treated with caution.

In spite of some minor inconsistencies, the best quality fruit of Navels, Valencias and grapefruit came from trees on *trifoliata* stock. Fruit from trees on *trifoliata* stock was often highest in specific gravity and juice content, was usually highest in acidity and was, in nearly all cases, highest in soluble solids in the juice and in flavour. The differences in general quality between sweet orange and rough lemon stocks were

not consistent. With Valencias fruit from sweet orange stock was generally of better quality than that from rough lemon stock, but in the case of grapefruit from Leeton and Navels and Valencias from Hawkesbury, rough lemon stock was somewhat better than sweet orange stock. In 1941 at Leeton, the juice content of grapefruit on sweet orange stock was much lower than that of fruit on rough lemon stock.

It isn't clever to talk about military matters. It's disloyal. Guard your tongue.

DERMATITIS OF SHEEP DUE TO THE MITE *Psorergates ovis.*

Results of Preliminary Dipping Trials

J. C. KEAST, B.V.Sc., Pastures Protection Board Veterinary Research Officer.

INFESTATION of sheep with the mite *Psorergates ovis* has been found over a wide area of New South Wales in recent months, up to 20 per cent. of some flocks having been infested. The irritation caused results in the sheep rubbing against logs and fences so that the fleece becomes torn and ragged, and in advanced cases badly cotted.

Although the dipping trials described in the following article have only been carried out for one year on one badly affected property, they have been so encouraging that results are published for the benefit of those interested in this parasite.

This disease affecting the skin and fleece of merino sheep, has been present in Australia for some time, but apparently has only become of sufficient importance in the last few years to warrant investigation. The disease is caused by a small mite, *Psorergates ovis*, invisible to the naked eye, which lives in the superficial layers of the skin of affected animals. The mite has not been recorded as infesting sheep in other parts of the world.

Detecting Infested Sheep.

Sheep infested with this mite have the appearance of being lousy, and generally behave as if lice-infested. Irritation is shown by sheep biting and scratching at affected parts and rubbing themselves against logs and fences, with the result that the fleece presents a torn and ragged appearance. The sites most commonly affected are the sides and hindquarters, with the condition often extending over the back.

The affected wool has a thin thready staple with a wispy tip, while the wool fibres are tender. In advanced cases the fleeces become badly cotted. The affected skin is tougher than usual, and often shows the accumulation of dry or greasy scurf. This abnormal fleece condition becomes evident as the length of the wool increases; even in severely affected flocks it is often not possible to pick out infested sheep until some months after shearing.

Mite infestation has a fairly wide distribution in New South Wales, having been found in sheep from properties in the Armidale, Bombala, Goulburn, Jerilderie, Tamworth, Yass and Young Pastures Protection Districts; there is reason to believe it is present also in other districts.

Only small numbers of sheep are infested on some properties, while on others up to 20 per cent. of the flocks show evidence of the

Ewe Infested with *Psorergates* sp., Showing Typical External Appearance of Fleece.
[*Photo by McMaster Laboratory, C.S.I.R.*]

presence of the mite. The rate of spread of the disease varies greatly on different properties and it is possible that the density of stocking may have some bearing on this.

Should the disease be suspected, it is advisable to have skin scrapings examined for the presence of mites, so that a definite diagnosis can be made. These examinations are carried out free by the Department, and

Samples of Wool from Normal and Affected Areas on the One Sheep.
Above.—From normal area.
Below.—From affected area, showing destruction of original staple form and traces of dry scurfy deposit.
[*Photo. by McMaster Laboratory,* C.S.I.R.

the local Stock Inspector will willingly collect the specimens from suspected affected animals.

Methods of Control.

In flocks where only small numbers of sheep are infested, and where the spread of the disease has not been rapid, it is possible that the isolation and disposal of affected sheep may control the disease. However, in severely infested flocks, heavy culling along the above lines has not proved effective in eradicating the mite.

Dipping trials have been carried out during the past year in an attempt to find a suitable solution which will destroy the causal parasite. Preliminary inquiries had suggested that *Psorergates* infestation had not been controlled on affected properties by annual dipping in arsenical and carbolic preparations. It was therefore decided to test the value of lime-sulphur solutions. These preparations had proved effective in controlling the scab parasite (*Psoroptes*), which was eradicated from Australia during the latter part of last century.

To Make Lime-sulphur Dip.

Lime-sulphur solutions are made by boiling lime and sulphur in water until a golden brown solution is obtained. They depend for their parasiticidal action on the formation of polysulphides, which are chemically unstable compounds. The amount of polysulphide present depends on the method of preparation. Whilst the dipping fluid can be prepared on the farm, it is probably advisable to purchase the ready-made concentrate because there is less variation in the commercially-prepared solutions than in the home-made dip.

For those who desire to prepare the solution, it should be mentioned that there are many formulae recommended for the preparation of lime-sulphur dips. The dip used with considerable success for the control of scab in South Africa is prepared by mixing 15 lb. good quality, freshly-slaked lime with 25 lb. flowers of sulphur, and making into a paste with water, and then boiling the mixture with 10 to 20 gallons of water until a golden brown solution is obtained. This solution is then made up to 100 gallons before dipping.

Details of the Trial.

A preliminary dipping trial with thirty affected sheep, using a hot, home-made lime-sulphur preparation, resulted in the disappearance of the symptoms of disease from these sheep. Unfortunately the trial had to be terminated before complete evidence was obtained that the mites had been destroyed. However, it appeared that this dipping had at least been of some value in controlling the disease. The owner of these sheep was impressed with the results

obtained and decided to dip all the sheep on his property once in a cold lime-sulphur solution.

At shearing in 1941 this owner had estimated that approximately 15 per cent. of his 5,000 sheep were showing evidence of mite infestation. The fleeces from about one-third of these affected sheep were so matted and cotted that they could not be classed into any of the normal fleece lines. This wool, totalling about five bales, realised 12d. per lb., while top fleece lines made to 19¾d.

Four to six weeks after shearing in 1941, all sheep on the property were dipped in a cold lime-sulphur solution. The dip was prepared by diluting a commercial lime-sulphur concentrate (stated to contain about 20 per cent. polysulphide) 1 in 20 with tank water, so that the final concentration was approximately 1 per cent. polysulphide. Additions of concentrate and water in the proportion of 1 in 20 were added to the dip from time to time to replace that removed by the sheep. The dipping continued for nine days, and at various intervals samples of the dip were collected for chemical analysis. These analyses showed that the polysulphide content of the dip varied from 1.02 per cent at the commencement to 0.48 per cent. at the termination of dipping.

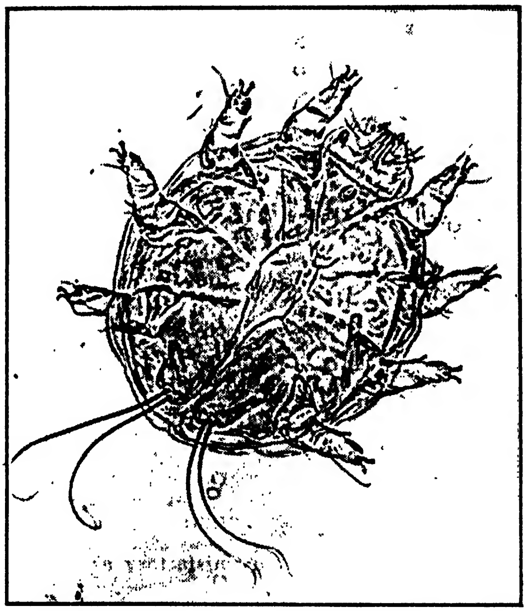
All sheep including lambs were kept in the dip for two minutes, their heads being pushed under two or three times, but even then the majority of the sheep did not appear to be completely wetted. It was found most difficult to wet lambs and the heads of adult sheep in a satisfactory manner with this cold lime-sulphur solution.

Good Results Obtained.

Prior to the 1942 shearing the various flocks were inspected by the owner when the sheep were yarded for lamb marking, etc., and, apart from one sheep, there did not appear to be any signs of the disease. This single sheep was found badly rubbed early in the winter and was immediately destroyed. In view of the apparent non-existence of the disease in all other sheep, it could probably be assumed that this sheep was missed at the muster and failed to go through the dip.

A closer inspection of individual sheep was made during the 1942 shearing, but this failed to reveal any obviously infested animals. Although microscopical examination for the presence of mites was not made, it can be assumed that the infestation has been greatly reduced, if not completely controlled on this property by the single dipping of all sheep for two minutes in a lime-sulphur solution.

It should be emphasised that although the above results are most encouraging, they deal solely with the dipping on one property, and it is not yet possible to say whether the disease will make its reappearance during the coming year.



Female of *Psorergates* sp. x 250.
Note two long pairs of caudal hairs arising from adjacent tubercles.
[*Photo by McMaster Laboratory, C.S.I.R.*

Those intending to dip sheep in lime-sulphur solutions should note that the dipping must be carried out carefully, as rapid death almost invariably ensues if the fluid is breathed into the lungs.

Another important point to remember is that all sheep in the flock should be dipped. By merely selecting and dipping obviously infested animals it is highly probable that some sheep carrying the mite will be missed, and these sheep then act as a fresh source of infestation.

FEEDS and FEEDING NOTES.

FEEDING PIGS FOR PROFIT.

(*Continued from page* 134.)

G. L. McCLYMONT, B.V.Sc., and F. H. W. MORLEY, B.V.Sc., H.D.A., Veterinary Officers; and F. BOSTOCK, Senior Piggery Instructor.

IN the first section of this article, published in the March issue, the authors set out what might be described as the "general principles of profitable pig feeding." They described the influence of the purpose of production and the stage of growth on feeds and methods and discussed the functions and practical importance in rations of food constituents.

The description of the use of various foodstuffs for pigs, commenced in March, is continued in this issue, and space is devoted to aspects such as the relationship of food values to costs, and the preparation of feeds.

Further Protein Concentrates.

Meat Meal.—Meat meal is usually one of the cheapest sources of protein on the market, and is particularly useful for feeding with the grains in areas where dairy by-products are unavailable or in short supply. There are various types of meat meals containing varying proportions of bones, and consequent varying proportions of protein. All recommendations in this article are based on a meat meal containing 55-60 per cent. protein.

Protein quality in meat meal varies according to the process of manufacture. "Dry-rendered" meat meal containing about 50 per cent. protein has been shown to be of equal value as a pig feed to "wet-rendered" meat meal containing 60 per cent. protein.

Meat and Bone Meals.—These contain 35-50 per cent. protein and consequently have lower values as supplementary feeds for pigs. The proportion fed should be increased by about half as much again as of 55-60 per cent. meat meal.

Blood Meal.—This is a fairly cheap protein concentrate, containing about 80 per cent. protein. Palatability varies considerably, but if mixed with pollard, this is improved. It may then be used as a valuable protein supplement.

Liver Meal.—Although not a usual feed for pigs, liver meal should be satisfactory as a protein supplement.

Fish Meal.—As a protein supplement fish meal has been shown to be equal to or better than meat meal. If fed in excess and containing excess fat it may cause a fishy flavour in the carcase. This taint may be eliminated by deleting the meal from the ration from four to six weeks prior to slaughter.

Linseed Meal.—Vegetable proteins, as a rule, have a lower value as supplements than animal proteins. However, linseed meal forms a valuable combination with meat meals, although unsatisfactory if fed alone. The well tried American "trio" or "trinity" protein supplement consists of two parts meat meal or fish meal, one part of linseed meal, and one part of lucerne or clover hay. This supplement has given very good results in the United States of America; in fact this mixture, under certain conditions, gave better results than meat meal alone, although containing less protein. It is probable that the main effect was due to the vitamin A in the hay; however, for pigs on green feed, the lucerne hay would be of little value.

Cottonseed Meal.—Cottonseed meal is considered dangerous for pigs, due to varying amounts of a poison named gossypol. American writers consider that cottonseed meal may form 9 to 10 per cent. of a balanced ration without undue risk.

Peanut Meal.—As a cheap protein supplement, pure peanut meal may be fed as the only protein concentrate, but is preferably combined with meat meal. If containing a high percentage of oil, peanut meal should not be fed in large quantities during the last month before marketing.

Maize Gluten.—As a protein supplement this is usually too expensive, and also somewhat too fibrous to be considered suitable for more than half the ration.

Cocoanut Meal.—Cocoanut meal is too high in fibre to be efficient, if forming more than half the ration. It produces a hard fat, and may be used to replace half the protein in the protein supplement.

Replacement Value of Protein Supplements.

Although, as has been stated, feeds vary in both quantity and quality of protein, the following table gives some indication of the value of the protein supplements in replacing 1 lb. of meat meal containing 60 per cent. protein.

Feed.	Percentage Digestible Protein.	Amount equivalent to 1 lb. of 55-60 per cent. Protein Meat Meal.
	Per cent.	
Skim milk ...	*3.5	18 lb. (1⅘ gallons).
Buttermilk ...	*3.5	18 lb. (1⅘ gallons).
Whey	0.6	100 lb. (10 gallons).
Blood meal ...	*69	¾ lb.
Liver meal ...	*60	1 lb.
Fish meal... ...	*55	1 lb.
Linseed meal ...	†30	2 lb.
Cottonseed meal ...	†34	1¾ lb.
Peanut meal ...	‡43	1⅓ lb.
Cocoanut meal ...	‡16	3½ lb.
Lucerne meal ...	†14	4 lb.

* May be used as the sole protein supplement.
† May replace up to one-quarter of the protein of meat meals.
‡ May replace up to half the protein of meat meals.

The value of a protein unit supplied by these feeds (published from time to time in the *Agricultural Gazette*) will determine the desirability of substituting one protein supplement for another.

Green Feed for Pigs.

Numerous experiments, and experiences of successful pig farmers, have shown that green feed is of considerable value for pigs. It is an economical source of vitamins, and may form a large part of the ration of growing pigs, and a complete ration for dry sows.

The following summarises the chief points about green feed.

3. Brood sows, in pig, may be maintained on green feed alone, if this is of good quality, during the first ten weeks after mating. They will consume about 25 lb. daily if no other feed is provided. If the green feed is not of very good quality, 1 to 3 lb. of grain per day should be given in addition. With grazing, exercise is provided for the sows and labour is saved.

4. By the use of a system of pasture and green crop rotation it is possible to obtain a higher standard of hygiene than where pigs are sty fed and only have access to small yards. Electric or other temporary fences, combined with rotation of crops through the yards, result in more efficient control of parasites and diseases.

SUITABLE CROPS FOR PIGS.*

	Sowing Season.	When Available.	Average Yield per Acre.	Remarks.
ROOT CROPS—				
Artichokes	Spring	May-Aug.	6 tons	Fed by grazing.
Mangolds	Spring and autumn	Sept.–Nov.	20 ,,	Must have deep, fertile soil.
Potatoes	,, ,,	Dec.–Aug.	5 ,,	Autumn sowing best on coast; spring sowing on Tablelands. Best stored before feeding.
Arrowroot	Early spring	June–Aug.	10 ,,	North Coast only.
Peanuts	Spring and summer	Mar.-May	6 ,,	Fed by grazing. Best for sows and young pigs as may cause soft fat.
Turnips	Autumn	May-Nov.	10-20 tons	Fed by grazing.
Sweet Potatoes	Spring	Jan.-June	......	Fed by grazing.
CEREAL CROPS				
Wheat, oats, barley, rye	Autumn	May-Oct.	6 tons	Graze when short and succulent.
Maize	Spring and summer	Dec.-April	15 ,,	....
Sorghum	,, ,,	Dec.-May	15 ,,	Should not be fed until crop comes into head on account of risk from cyanide poisoning.
Sudan grass	,, ,,	,,	8 ,,	Should not be fed until crop comes into head on account of risk from cyanide poisoning.
Millet	,, ,,	Nov.-April	8 ,,	....
OTHER CROPS				
Lucerne	Autumn and spring	Sept.-May	12 ,,	In many districts gives some grazing throughout the year.
Red clover	,, ,,	April-Jan.	6 ,,	Will last 2-3 years when grown as a pasture.
Cowpeas	Spring and summer	Jan.–April	8 ,,	....
Rape	Autumn	June–Sept.	......	....
Pumpkins	Autumn and spring	April–Oct.	8 ,,	Autumn sowing usually best.

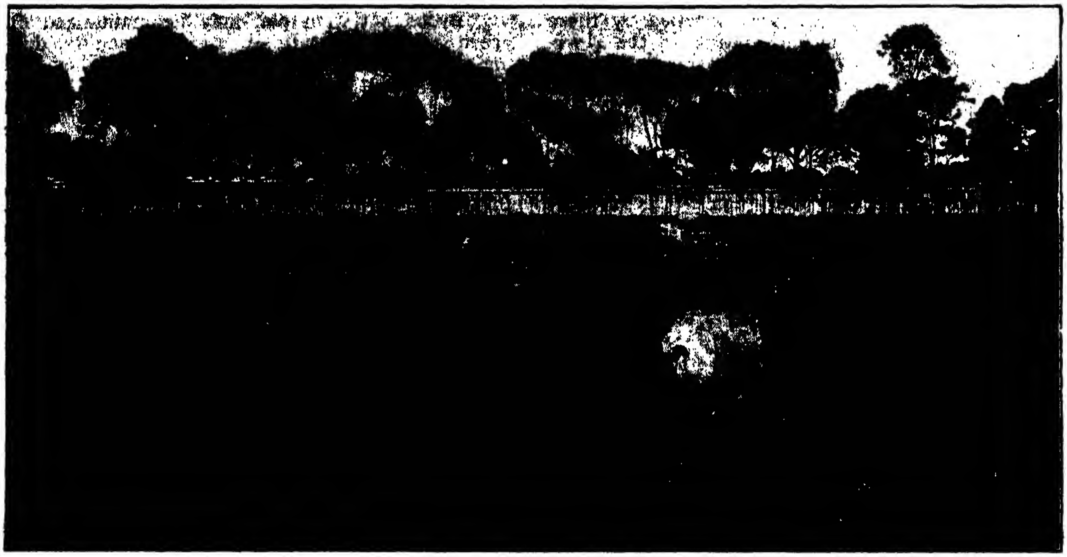
* This is a general table. Further detailed information on crops for pigs for particular districts may be obtained from this Department.

1. When sty fed 1-2 lb. of freshly cut green feed per day should provide ample vitamins for pigs of all ages. However, if green feed is wilted it rapidly loses a great part of its vitamin content. Therefore hay, or dried grass, is an unreliable vitamin supplement for pigs, although freshly cured lucerne hay or lucerne meal is a good substitute if green feed is not available, 5 per cent. in the ration being sufficient.

2. Although pigs are not usually finished on green feed alone, such crops as lucerne, grazing oats or wheat, and good pasture may replace a large part of the grain ration. About 6 lb. of green feed may be used to replace 1 lb. of grain.

Carrying Capacity.—Generally speaking, about ½ to ¾ acre per sow is a reasonable allowance, where an intensive system of crop rotation and subdivision is carried out.

Management of Grazing Areas.—Pigs not infrequently spoil good grazing by rooting up the ground. Although not serious in annual crops such as rape, this habit creates a problem with permanent pasture or perennial crops such as lucerne. Where it is desired to prevent pigs from rooting, rings placed in the noses will help, although the effect is not always permanent. Provision of shade and adequate drinking water will assist in minimising this trouble. Pigs may only



Brood Sows Grazing under Ideal Conditions.

be allowed on to the pasture for limited periods, being taken off as soon as it is noticed that they are commencing to root.

Whenever pigs are being fed on pasture or cereal crops, it should be remembered that young, leafy pasture has far greater value than pasture in the flowering stage. Therefore, the pig raiser should always attempt to have his pastures at the young succulent stage. To achieve this result an intensive method of subdivision and feeding off is required. Electric fences should be of assistance in subdividing pastures without undue expense.

Industrial Residues.

Residues from the manufacture of cereal breakfast foods and biscuits (biscuit meal) are available for pig feeding, and if fed like wheat with green feed, and meat meal or skim milk, good results can be obtained.

These feeds are low in fibre with a high proportion of digestible matter, but are rather low in proteins, vitamins and minerals, so that if not supplemented as above and with limestone and salt, good growth rates will not be obtained.

Garbage Feeding.

The quality of garbage varies greatly, and it is difficult to make any recommendations for supplementary feeds. If the garbage is mostly bread scrap, some protein concentrate should be included. If it contains a large quantity of meat scraps, more grain or pollard may be included if greater use of the available garbage is desired.

Persons feeding garbage are required by law to fulfil certain conditions, details of which may be obtained from local Health Inspectors. Garbage should be thoroughly boiled before feeding, otherwise there is considerable danger that the pigs will contract diseases, particularly those carried in meat scraps such as swine fever. As boiled garbage may be deficient in vitamins, green feed should always be supplied as a supplement.

Food Values in Relation to Costs.

A knowledge of food values and their relation to costs is essential for economic production.

The following table shows the weights of different feeds approximately equivalent in food value to 1 lb. grain. Obviously the greater amount of food required to replace the grain, the lower is its food value:—

1 lb. of grain (maize, wheat, barley, or sorghum) is approximately equivalent to:—

Pollard	1·1 lb.
Oats	1·2 lb.
Bran	1·3 lb.
Potatoes (Boiled) *Or* Arrowroot *Or* Artichokes *Or* Sweet Potatoes	4·0 lb.
Pumpkins	7·5 lb.
Mangolds *Or* Turnips	10 lb.
Green Feed	5–7 lb.

These figures can be used when substituting other feeds for grain. Thus, if it was desired to replace one-third of a 3 lb. grain ration by pumpkins, it would be necessary to feed 7.5 lb. of pumpkins.

As the weights by which feeds are sold, as well as the feed values, vary a great deal, both these factors must be taken into account when comparing market cost of feeds. In the following table the difference in food values (including the slight difference between grains) and the weight units have been taken into account in order to show equivalent prices of common feeds.

It is used as follows:—The top line records different prices of wheat, and the succeeding lines

TABLE OF EQUIVALENT PRICES OF FEEDS.

	s. d.	s. d.	s d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Wheat (bushel of 60 lb.)	2 0	2 6	3 0	3 6	4 0	4 6	5 0	5 6	6 0
Wheatmeal (100 lb.)	3 4	4 2	5 0	5 10	6 8	7 6	8 4	9 2	10 0
Maize (bushel of 56 lb.)	2 0	2 6	3 0	3 6	4 0	4 6	5 0	5 6	6 0
Maize meal (100 lb.)...	3 7	4 6	5 4	6 3	7 2	8 0	8 11	9 10	10 9
Barley (bushel of 50 lb.)	1 8	2 1	2 6	2 11	3 4	3 9	4 2	4 7	5 0
Barley meal (100 lb.)	3 4	4 2	5 0	3 10	6 8	7 6	8 4	9 2	10 0
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d	£ s. d.
Pollard (short ton)	3 0 0	3 15 0	4 10 0	5 5 0	6 0 0	6 15 0	7 10 0	8 5 0	9 0 0
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Oats (bushel of 40 lb.)	1 2	1 5	1 8	2 0	2 3	2 6	2 9	3 1	3 4
Potatoes (cwt.)	0 11	1 2	1 5	1 8	1 10	2 1	2 4	2 6	2 9

record equivalent prices of other feeds, *i.e.*, prices at which these feeds would be equally good buying. Thus with wheat at 3s. 6d. per bushel (60 lb.), maize meal would be equally good buying at 6s. 3d. per 100 lb. and pollard equally good buying at £5 5s. per short ton. However, if maize meal at the time were 8s. 6d. per 100 lb. it would be a dearer feed than wheat, and if pollard were £4 15s. per ton it would be a cheaper feed than the wheat. If this table is used in conjunction with current market reports it will lead to the buying of the cheapest sources of feed matter, and so establish the foundation of economic production.

An important point that must be kept in mind when using this table is that when comparing feed prices, the *final cost* must be considered, *e.g.*, in comparing wheat with wheat meal, cost of crushing, about 2d. per bushel, must be added to the cost of wheat. Also freight costs for different feeds may differ so that these must be added before a comparison is made.

Potatoes have been included, not so much on account of the fact that they are widely used as a pig feed, but in order to demonstrate the effect that high water content has on the price which can be paid for a feed (potatoes contain about 80 per cent. water as against 10 per cent. in wheat).

Comparing Proprietary Feeds.

Many proprietary pig feeds are available, and a simple method of comparing their feed value and cost with those of other common pig feeds is valuable. Under the Stock Foods and Medicines Act, 1940, it is required that for all stock foods the minimum protein content, minimum fat content and maximum fibre content and the materials from which the feed is prepared, be shown on the package or invoice. The following are the average analyses of common feeds:—

	Crude Protein.	Crude Fat.	Crude Fibre.
	per cent.	per cent.	per cent.
Wheat or wheat meal.	8–12	2	2–3
Maize or maize meal.	10	4	2
Barley or barley meal.	10	1.5	2–3
Pollard ...	15	4	5.7
Oats	11	5	10
Bran	15	3	8

An idea of the composition of the proprietary feed is obtained, and this can be compared with the known food value of the common feed.

Thus if a proprietary pig feed has a declared analysis of—

Minimum protein, 11 per cent.
Minimum fat, 2 per cent.
Maximum fibre, 3 per cent.

it is apparently of about equal food value to wheat meal or barley meal, and so can be compared with the current price of this material.

Similarly, if a feed were stated to contain—

Minimum protein, 15 per cent.
Minimum fat, 7 per cent.
Maximum fibre, 9 per cent.

it would be considered to be of rather low food value, because of its high fibre content. It is noted that the fibre content is approximately that of oats and bran, and so could be compared in price with these materials.

Proprietary protein supplements should be compared on a basis of protein content, and the feeds used in manufacture, bearing in mind the low quality of vegetable proteins in comparison with animal proteins. Compare the cost and protein content with meat meal which has the following average composition:—

Minimum crude protein, 55-60 per cent.
Minimum crude fat, 8-13 per cent.
Maximum crude fibre, 1-4 per cent.

However, the cost and food value of dried milk by-products should not be computed on these standards, owing to the high quality of protein in these products.

As a mixture of feeds may have an advantage in food value over a single feed of similar analysis, mixtures may be given a slight premium in price over single feeds.

Preparation of Feeds.

Soaking and Boiling.—In the past it was commonly considered that feeds for pigs required cooking or soaking, and should be fed as slops. Practical pig farmers and experiments have since shown that dry feeding will give results that are as good, or better than, slop feeding. Soaking and cooking grain are laborious and expensive processes, and have never been shown to be justified. Cooking refuse, however, is advisable to prevent the spread of diseases such as swine fever. Potatoes and possibly soyabeans should be cooked before use, as this increases their digestibility.

Damping.—In windy weather it may be advantageous to dampen feed slightly, thereby making it easier to handle, and preventing waste from the wind blowing away small particles of ground grain. This dampening, however, in no way in-

creases the food value of grain, and is unjustified unless for the reasons given.

Grinding of Feeds.—Wheat, barley and grain sorghum should be coarsely crushed when hand feeding pigs, as the increase in digestibility obtained by crushing may be up to 20 per cent. As the cost of crushing is only 2d. or 3d. per bushel, this entails, with wheat at 4s. per bushel, an added cost of only 5 per cent., so that the economy of crushing is obvious. However, when pigs are fed from self-feeders it usually does not pay to crush the grain as the pigs have more leisure in which to masticate the grains more thoroughly.

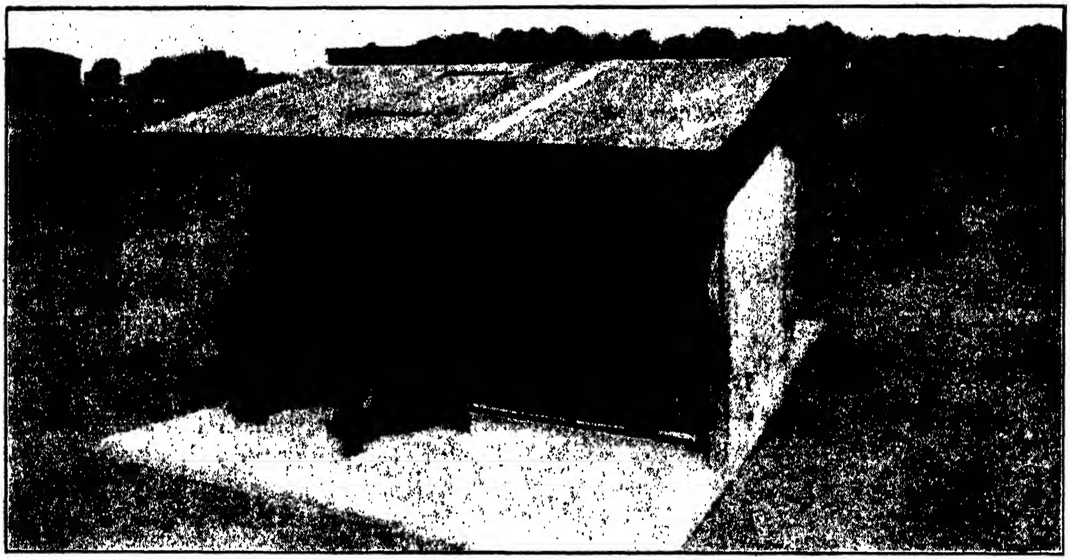
Maize appears to be slightly improved by crushing for hand-fed pigs, but the increase in digestibility is usually not as great as for the smaller grains, and may not pay for the cost of crushing. In general, if maize is below about 4s. 6d. per bushel, crushing will not pay for itself.

Fine grinding, a much more expensive process than coarse grinding, is quite unjustified, as the finely ground grain is no more digestible than the coarsely ground grain, and is more liable to be unpalatable owing to the doughy paste that may form in the mouth of the pig.

Self Feeders.—Self feeders enable a considerable saving in labour, and are a very practical method of feeding grain, especially during the growing stages, when heavy feeding is desired. It is not desirable to use the self feeder for brood sows, as these are best kept in condition by feeding a limited supply of grain, with unlimited access to pasture or crops.

It must be remembered, however, that a self feeder is by no means a substitute for a knowledge of feeding. Furthermore, the self feeder must not be neglected; just because the hopper has been filled with grain one cannot afford to forget about it.

The old adage, "The eye of the master fattens his cattle," holds good when applied to the self-feeding of pigs. If the feeder is left without attention the feed may become blocked in the hopper, thus leaving the pigs with a "dead" feeder, or the feed may become soiled in the trough, making it unpalatable to the pigs.



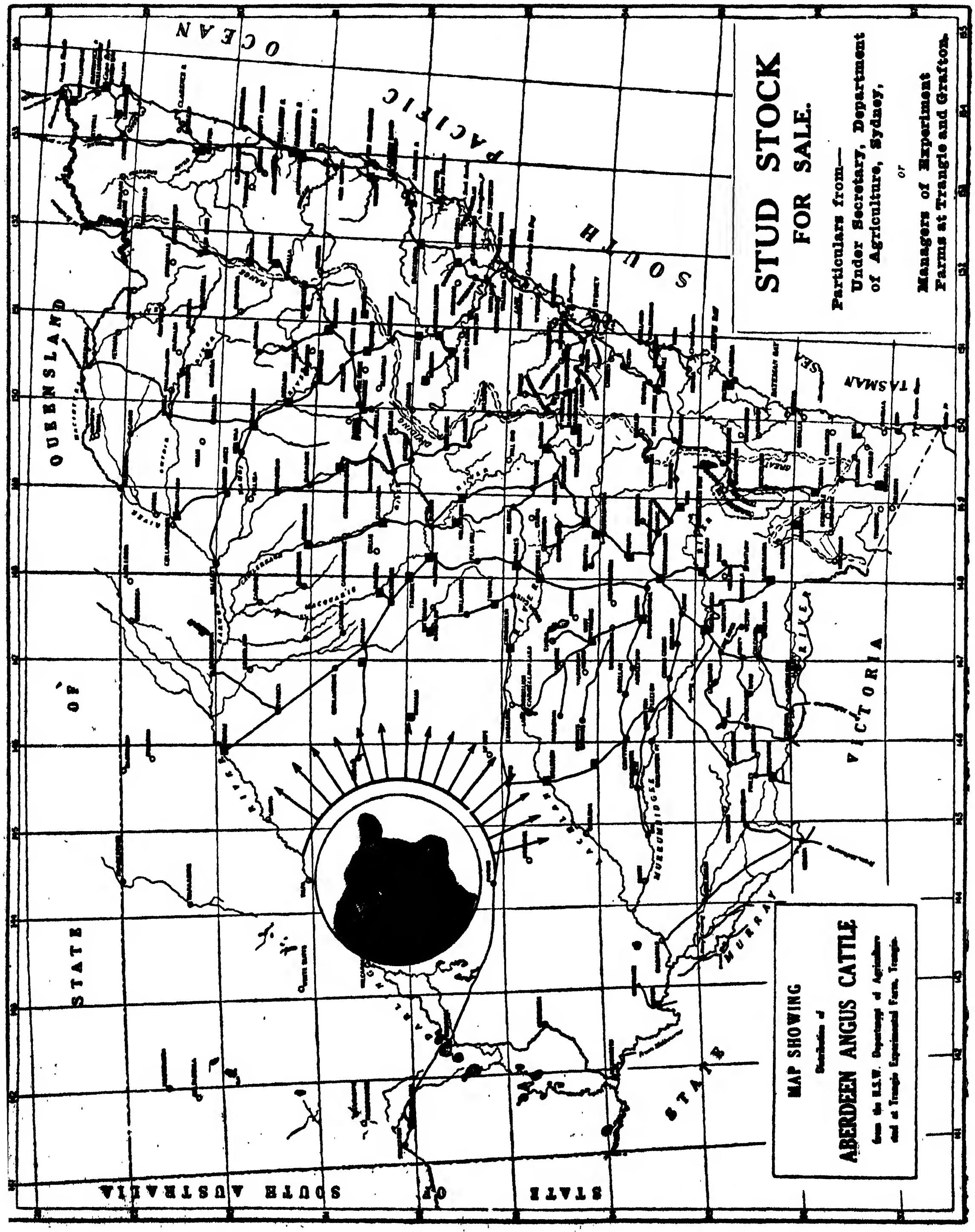
Self Feeders are Becoming More and More Popular.
They save labour, and pigs make more rapid gains.

When it is proposed to supplement the grain (self-fed) with dairy by-products, there will be no need to feed concentrates such as meat-meal because skim-milk is most suitable to balance such grains as maize, wheat or barley. The dairy by-products cannot be self-fed, for they would soon spoil if more were fed than the pigs could clean up at one feeding. Self-feed the grain and hand feed twice daily enough skim-milk to balance the ration—(*To be continued.*)

Current Feeding Costs.

Supplementary Pastures.

THE falling off in quality of summer pastures due to lack of rain and increasing maturity is causing diminished milk yields in many parts of the State. It is important to remember that during the later stages of growth there is a rapid diminution of protein content of pastures. Where dairymen are experiencing reduced milk yields, even though there is plenty of rough feed available, they are advised to feed protein concentrates. Even 1 to 2 lb. per cow per day should form a valuable supplement to the pastures. Where unable to obtain protein concentrates, a few pounds of good quality lucerne hay should be fed.


STUD STOCK
FOR SALE.
Particulars from—
Under Secretary, Department
of Agriculture, Sydney,
or
Managers of Experiment
Farms at Trangie and Grafton.
MAP SHOWING
ABERDEEN ANGUS CATTLE
SOUTH PACIFIC OCEAN
TASMAN SEA
STATE OF QUEENSLAND
VICTORIA
STATE OF SOUTH AUSTRALIA
STATE

Protein Concentrates.

As protein concentrates are in short supply, and the position is unlikely to improve, lucerne and other high protein legume hays should provide a basis for fodder conservation. Lucerne hay and silage are ideal high protein roughages for dairy cattle.

Provision for Winter Grazing.

Now is the time to sow crops for winter grazing. In most districts oats is the main standby, with wheat and barley occupying a prominent position. Rape should provide good green feed for fattening stock, particularly pigs and lambs. It is advisable, at this stage, to take stock of any temporary fencing, and make necessary repairs. Supplies of temporary fencing are very short or unobtainable, so that farmers are urged to make the best of what they have.

High Cost of Roughages.

Roughages are still a more expensive source of food units than concentrates. Wherever possible dairymen should endeavour to make full use of home-grown roughages—pasture and crops—and feed concentrates in the bails, if necessary.

Feed.	Starch Unit Value per 100 lb.	Protein Unit Value per 100 lb.	Cost.	Cost per Starch Unit.	Cost per Protein Unit.	Remarks.
ROUGHAGES.						
Lucerne hay or chaff (good, sound).	35-45	9	£7 10s.-£8 10s. long ton*	2d.-2·3d.	...	Roughage still more expensive than concentrates. Therefore grow own roughage wherever possible.
Oaten and wheaten hay	33	3	£9-£10 long ton.* ...	3d. 3.3d.	...	
Oaten and wheaten chaff.	40	3	£6 10s.-£7 10s. long ton*	1·8d. ·2d.	...	
Oaten straw	20	0·6	£5 10s.-£6 5s. long ton*	3d.-3·4d.	...	Too expensive for feed purposes.
Wheaten straw ...	14	0·1	£6 long ton*	4·6d.	...	
Oat hulls	21	0·5	£3 15s. long ton* ...	1·9d.	...	Supplies scarce.
Rice hulls	3	0·3	....	...	...	Not worth buying as a feed at any price
STARCHY CONCENTRATES.						
Maize	78	8	7s. 6d. bushel	2d.	...	Too expensive.
Maize meal	78	8	£15 short ton† ...	2·3d.	...	
Wheat	72	8	3s. 9d. bushel	1d.	...	Wheat and barley are both cheap feeds. Will probably pay to crush own grain if possible.
Wheat meal	72	2	£7 short ton†	1·2d.	...	
Barley	71	7	3s. bushel	1d.	...	
Barley meal	71	7	£7 short ton†	1.2d.	...	
Oats	62	8	2s. 9d. bushel	1·5d.	...	Not as good buying as wheat or barley.
Crushed oats	62	8	3s. 6d.-3s. 8d. per 40 lbs. £8-£9 per short ton†.	1.7d.-1·9d.	...	
Wheat bran	55	10	£6 short ton†	1·3d.	...	Worth buying for use as part of dairy and poultry rations to improve the texture.
Wheat pollard ...	66	10	£6 short ton†	1·1d.	...	Worth buying if available.
Hominy meal	78	8	£20 short ton† ...	3d.	...	Too expensive.
Rice meal	72	6·5	....	...	...	None available.
Rice pollard	72	7	....	...	...	None available.
Molasses	50	1	£3 10s. per 40 gallons...	3·4d.	...	Supplies almost unobtainable. Only worth buying for drought use.
PROTEIN CONCENTRATES.						
Meat meal (60% crude protein).	80	55	£10 10s. short ton† ...	...	2·3d.	Supplies fair.
Blood meal	66	67	£14 short ton† ...	...	2·5d.	Supplies available.
Liver meal	94	58	£14 10s. short ton† ...	...	3d.	Supplies light.
Fish meal	59	53	....	...	...	None available.
Linseed meal	72	25	£10 10s. short ton† ...	1·7d.	5d.	Supplies fair.
Peanut meal	78	43	£6 10s. short ton† ...	1·1d.	1.8d.	Supplies limited but cheapest protein concentrate available.
Cocoanut meal ...	76	16	....	...	...	None available.
Maize gluten	78	20	£9 short ton†	1·4d.	5·4d.	Supplies fair.

* Long ton—2,240 lb. † Short ton—2,000 lb.

MASTITIS IN DAIRY HERDS.

Steps to Prevent or Control its Spread.*

THERE is still much to learn about mastitis in dairy cows. Attempts have been made to eliminate the infection from some herds, and in a proportion of cases these have been more or less successful. Even though our knowledge is incomplete, much more can be done to keep the occurrence of the disease down to a minimum.

In the following article are set out some of the more simple, straight-forward facts that should guide dairy farmers in their attempts to control the spread of mastitis in their herds.

The commonest form of the disease is the so-called chronic mastitis. This is due to the mastitis streptococcus, *Streptococcus agalactiae*.

Another common form, which appears to be most severe in young cows, is due to a staphylococcus, very much the same type of germ that causes boils in human beings.

Other forms, in which there is a very acute inflammation in the udder with general distress, are seen less commonly, but sometimes they may spread rapidly to the majority of the cows in a herd. These may be due to other types of streptococci or to types of bacteria found in the bowel.

Control Varies with Type of Mastitis.

One type of mastitis may possibly be controlled by some special method, but this method may be useless for the control of other types. This leads to confusion in the minds of dairy farmers and sometimes of control officers, especially if laboratory aid in diagnosis is not available.

Recent work shows that the bacteria which commonly cause mastitis may be carried by cows which have not developed any sign of disease. These bacteria may also be present in sheds, on utensils and possibly in yards and camping grounds. In other words, the environment may hold these bacteria, which may have a chance of entering the udder at any time, but especially during milking operations.

The majority of workers believe that the bacteria enter the udder by growing up the teat canal and then progressing until they establish themselves in the milk sinuses. The evidence suggests that the infection of the teat canal takes place most commonly while the cow is in the milking shed. A small number of first-calf heifers become infected before they have ever entered the milking shed, but they form a small minority.

Prevent Infection of Teat Canal.

If we concentrate, therefore, on preventing infection of the teat canal in the milking shed we should be able to prevent the most common form of infection and, further, the method should be just as effective against the mastitis streptococcus as against the staphylococcus or the other types of bacteria which can cause mastitis.

There is one additional important point to remember. A cow affected with mastitis is carrying more of the harmful bacteria than one that is not affected. It can increase the number of harmful bacteria in the environment and thus increase the chance of any other cow becoming infected.

Efficient Milking an Important Factor.

If the milk is withdrawn from the cow in the most efficient manner, mechanical injury to the udder is avoided, and time is saved which can be employed in doing essential things properly instead of in a slap-dash manner or not at all.

Every dairy farmer should try to understand the anatomy (the structure) of the udder and how milk is secreted and "let down." Only a brief mention of some of the essential features can be made here. Each quarter is a separate unit: there is no connection between the gland tissues of adjoining quarters. Each quarter is made up of the secreting tissue which may be compared in structure to a bunch of grapes. Each grape represents the cell in which the milk is formed. The milk then flows along the stalk or duct to a larger stalk or duct until the main stalks or ducts empty into the collecting cavity or milk cistern, which in turn leads into the teat canal. All this secreting and collecting tissue, or system, is supported by loose tissue containing blood vessels, nerves and fatty tissue and special muscle fibres, like those in the wall of the gut.

Cow Must "Let Down" Milk.

Milk is being formed or secreted all the time and gradually fills all the ducts and the milk cistern. At the end of the teat a strong muscle band keeps the teat canal closed and prevents the escape of the milk. The milk can be forced out through the canal by pressure. The pressure exerted on the teat, however, is not enough if the quarter is to be milked out quickly. Something must happen: the cow must "let down" the milk. This letting down of the milk is only an increase of the pressure within the quarter itself which forces the milk from the collecting ducts into the cistern. This increase of pressure is brought about by the contraction of the muscle fibres surrounding the cells and the ducts in the

* Contributed by the Mastitis Investigation Committee.

gland. What forces the muscle fibres to contract? This contraction is brought about by what is called reflex action. When the calf sucks or the milker starts to milk, the nerves in the tissues send messages to the brain which in turn sends messages to a special gland which throws into the blood stream a special substance which acts on the muscle fibres in the udder and causes them to contract and to force the milk down. This action occurs quickly and passes away almost as quickly.

Conditions Conducive to Efficient Milking.

Cows become used to being milked, and merely to bring them into the shed starts the complex mechanism which leads to the letting down of the milk. In order that this mechanism be used to the best advantage, and in order to carry out efficient milking, certain conditions must be observed and these are stated as follows:—

(*a*) There should be a rigid routine in the milking shed: so far as possible things should be done always in the same way and in the same order without undue delay.

(*b*) Especially there should be no delay in starting the milking after the udders have been washed or handled in any way. Don't wash the udders or handle them except immediately before starting to milk. Don't run down the line and wash the udders first and then go back to the beginning of the line and start the milking.

(*c*) The milking operation, whether by hand or by machine, should be as rapid as possible.

(*d*) The degree of vacuum at which the milking machine operates should be under efficient control. This is best provided by a weighted vacuum relief valve or by a spring loaded poppet type with covered spring. The machine should not be operated at a higher vacuum than that necessary to keep the teat cups on and 15 inches of vacuum is recommended as the maximum. This should not be exceeded.

If this routine is carefully followed the quarters will be rapidly and completely emptied and there will be no necessity to spend time in stripping.

After efficient milking there is no necessity to strip. The small amount of milk left in some quarters will be recovered at the next milking. If left in the quarter it will do no harm.

The physical violence of stripping, of unduly high vacuum, or of leaving the cups in position too long does harm, whereas leaving half a pound or more milk in the quarter does not.

Clean Methods Prevent Infection.

If we have efficient milking we have a sound basis on which to build a system to prevent bacterial infection of the udder in the milking shed. The sheds must be kept clean and free from dust. The aim must be to have the teats clean and sterile and the teat-cups of the machine or the hands of the milkers also clean and sterile.

It is easier to sterilize the teat cups than the milkers' hands. The procedure should be as follows:—

(*a*) Wash the teats with warm soapy water. Wring out the washing cloth and dry off excess moisture.

(*b*) Sterilize the teats with a solution of hypochlorite. This can be made either from powder or liquid preparations on the market. The strength of the preparation is indicated by the manufacturer in terms of available chlorine, and this should be used to prepare a solution containing at most 1 part of chlorine to 800 parts of water or not less than 1 part of chlorine per 1,000 parts of water. *The solution must be made fresh at each milking* and can be applied with a cloth. Another way to apply the solution is to fill a deep (6 inches) narrow (2 to 3 inches) vessel with the solution and to dip each teat in turn into the solution which can be replaced frequently from the bulk solution kept in a bucket. Any excess fluid can be shaken from the teats: don't apply the hand or cloth in an attempt to dry.

(*c*) Place the sterilized teat cups in position as soon as possible after sterilizing the teats.

(*d*) After milking each cow the cups must be cleaned and sterilized. To clean, plunge them into a bucket of warm water containing washing soda (1 heaped dessertspoonful to each gallon) and raise and lower them two or three times. Shake off the water and plunge the cups into a bucket of hypochlorite solution, holding them in this for ten to twenty seconds.

Cleansing and Sterilizing Solutions.

The hypochlorite solution will not sterilize a dirty or greasy surface. Therefore, the use as directed of warm soda water is essential. If the teats are sterilized and the cups are sterilized before use, it will be impossible to carry infection from one cow to another. The system must be rigidly observed. Fresh batches of warm soapy water, warm soda water and hypochlorite solution will be required during the milking operations. This applies especially to the soapy water for the teats and the soda water for the cups. They will have to be renewed just as often as necessary according to the number of cows. If any of these solutions become dirty they will contaminate the teats or the cups and their use will do more harm than good.

Sterilization of the teat cups can be carried out by boiling water or steam where these are available, but heat is damaging to the rubber, especially when it is in contact with the metal.

Other types of disinfectants than hypochlorite are unsatisfactory because of odour, slowness of action on bacteria or destructive action on the rubber of the cups. Potassium permanganate (Condy's crystals) has been used by some people, but it stains most objects badly, is not as good a disinfectant as hypochlorite, and manganese is regarded as a rubber poison; that is, it spoils the rubber.

In hand-milking the same principles are followed and the milkers' hands are washed in soapy water and then in the hypochlorite solution before the milking of each cow.

The care and sterilization of the milking machine after each milking and the regular weekly dismantling and cleaning should be carried out according to the instruction of the dairy supervisor.

Handling of Cows with Mastitis.

Early recognition of disease in the udder is important. A careful watch should be kept on every quarter at each milking. Slight signs of inflammation can be detected easily enough if looked for. If a quarter is swollen and feels hot it is usually infected. Sometimes there are no signs of swelling or heat in the quarter, but the milk is altered or contains clots. Clots can be detected most easily by passing the first few streams of milk through a fine wire gauze or a so-called strip cup. The use of the strip cup is strongly recommended and the test should be used on every cow once a day if possible. A strip cup made by fitting a movable strainer to a tin pannikin is shown in the illustration on this page.

Any cows showing signs of mastitis should be taken out of the line and milked last.

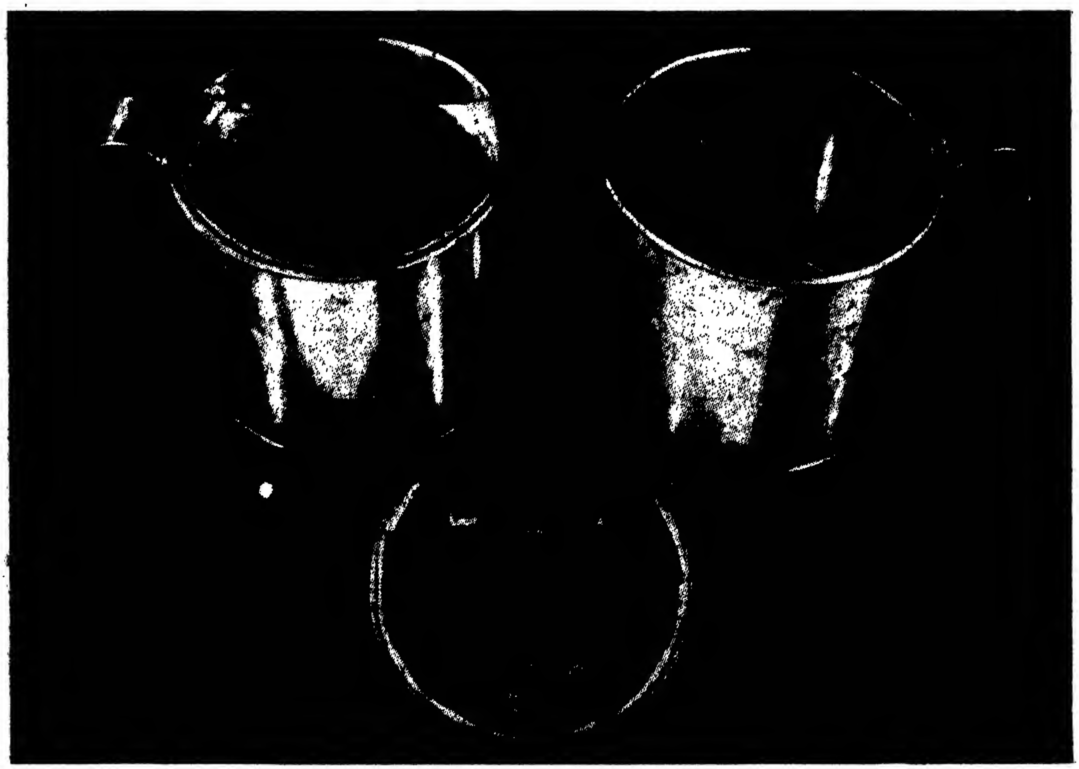
When purchasing cows make sure they are free from mastitis.

The Handling of the Herd.

Calves and pregnant heifers should be kept as far away as possible from the milking herd.

Milking cows should have as much fresh green feed as possible at all times of the year.

When a cow is coming to the end of a lactation period and a decision is reached to dry-off the cow, cut down the food intake, then cease milking altogether and turn it out. Do not practise irregular milking to dry-off a cow. Very heavy producers may need special attention.



A Strip Cup Made by Fitting a Movable Strainer to an Ordinary Tin Pannikin.

The strainer is of brass gauze, 64 mesh, and is soldered over an opening in a light gauge galvanized circular plate from the edge of which a strip has been cut in order to leave a space through which milk can be poured from the pannikin. To provide a shoulder, galvanized wire of 16 gauge has been soldered to a strip of galvanized iron ½ inch deep, which is soldered to the upper edge of the plate. The mounted strainer slips on and off the lip of the pannikin to permit ease of washing in water to remove any solid matter retained on the gauze after each test stripping.

De-horn calves so as to lessen the injuries caused to udders by cows horning one another.

Summary of Recommendations.

(*a*) Keep to a rigid routine in the milking-shed; aim at rapid and efficient milking and thus remove the necessity to strip cows.

(*b*) Provide at least four buckets for washing and sterilizing udders and teat cups. Use one bucket to contain warm soapy

water for washing the udders. Use another to hold a solution of hypochlorite containing 1 part of chlorine to 800 parts of water. The other two buckets are reserved for the teat cups. One bucket will hold a solution of washing soda (1 heaped dessertspoonful to each gallon of water); the other will contain hypochlorite solution (1 part of chlorine to 800 parts of water).

(*c*) Wash the udder with the soapy water and renew this solution frequently before it becomes dirty. Dry the udder with the wrung-out cloth. Sterilize the teats by washing them with, or dipping them into, the hypochlorite solution, but do not dry. At the end of the milking sterilize all cloths used for washing udders by boiling them in water.

(*d*) Place the clean sterilized teat cups into position as soon as possible after sterilizing the teats. Remove the cups when ready, wash them in warm water containing washing soda and then dip them into the hypochlorite solution for ten to twenty seconds. They are then ready to transfer to the next cow.

(*e*) For hand-milking adopt the same principles. Wash and sterilize the udder: wash and sterilize the hands before milking each cow.

(*f*) Remove any cow with mastitis from the line and milk it last.

(*g*) Purchase only healthy cows free from mastitis.

(*h*) Keep calves and heifers away from the milking herd.

(*i*) When a cow is to be dried off cease milking altogether: don't milk irregularly or overstock to dry-off.

(*j*) De-horn calves.

Official Recordings of the Department's Herds.

273 Days' recording completed during February, 1943.

Cow.	Sire.	Owner.	Age at beginning of test. yrs.	mths.	Milk. lb.	Average test. per cent.	Butter fat. lb.
		Australian Illawarra Shorthorn.					
Mature Cows							
Coral Grange Lide 8th ...	Guardsman of Fairfield ...	Grafton Experiment Farm	9	1	11,865	3·8	452·98
Coral Grange Queen 11th ...	Coral Grange Duchie's Heir	" " " ...	9	8	13,315½	3·3	434·63
Cowra Shamrock	Berry Kingston	" " " ...	7	1	9,591	4·1	394·77
Arkesden Silver 9th ...	Drumora Masterpiece ...	" " " ...	8	6	10,374	3·7	379·74
Senior 4 years—							
Coral Grange Duchie 16th ...	Coral Grange Guardsman ...	" " " ...	4	6	8,697	3·8	333·85
		Guernsey.					
Mature Cows—							
Wollongbar Circe	Wollongbar Agricola ...	Wollongbar Experiment Farm.	7	0	7,592¼	5·3	400·23
Wollongbar Lavender ...	Wollongbar Arcadian ...	" " ...	8	11	7,847¼	5·0	393·73
		Jersey.					
Mature Cow—							
Richmond Nora 3rd ...	Richmond Nemesis ...	Hawkesbury Agricultural College.	6	5	10,408½	5·1	534·14
Junior 4 years—							
Yanco Minnie 22nd ...	Belgonia Gem's Ruler ...	Riverina Welfare Farm ...	4	2	5,983½	4·5	267·05
Junior 3 years—							
Richmond Evaline ...	Right Cute (Imp.)	Hawkesbury Agricultural College.	3	1	7,554	5·4	409·76
Richmond Spring Song 3rd	Foxbury Arkona's Count ...	" " ...	3	1	7,047	5·1	356·32
Senior 2 years—							
New England Dessie ...	Dreaming Peter (Imp.) ...	Wagga Experiment Farm ...	2	11	3,335¼	4·9	162·43
Junior 2 years—							
Bathurst Larkspur	New England Digger ...	Hawkesbury Agricultural College.	2	0	6,346½	5·1	324·81
Richmond Flower 4th ...	Right Cute (Imp.)	Wagga Experiment Farm ...	2	2	5,689½	5·0	286·69

The Department's Telegraphic Address.

PERSONS or organisations desiring to communicate with the Department of Agriculture by telegram, should note that registered telegraphic address is "Agridept, Sydney." Where the message is for a particular officer, his name should precede the registered code words.

THE name of the Government Poultry Farm at Seven Hills has been changed to Poultry Experiment Farm, Seven Hills. Poultry farmers and others communicating with the institution in future are asked to address their letters to The Poultry Instructor, Poultry Experiment Farm, Seven Hills.

The Castration of Bulls.

Hygienic Methods will Reduce Losses.

B. C. Veech, B.V.Sc., District Veterinary Officer (North-east).

ALTHOUGH the removal of the sex organs (testes) of male animals, or the destruction of their functions, has been carried out (often in the crudest manner imaginable) from time immemorial, many stockowners know very little about the operation, which is regarded by others as a comparatively simple one.

The purpose of this article is to describe the castrating of bulls by methods that are not only practicable, but also more "humane" than those sometimes practised.

There are many reasons for the castration of bulls and chief among these are:—

1. To prevent bulls from which it is not desired to breed from producing offspring. In this way breeds and strains can be retained and kept pure more easily, and fresh and improved types created.

2. To improve the quality of the animal's body products. It is well known that the flesh and hides of castrated male cattle are superior in quality to those of the non-castrated beasts.

3. It is economical. Castrated cattle are more easily controlled, being temperamentally improved and rendered quieter, and they can be grazed with female cattle; they also fatten more quickly.

4. To control disease, since certain diseases of the reproductive organs in both male and female animals can be spread during service.

While bulls can be castrated at any age, generally speaking the operation is carried out at ages ranging from a few weeks up to about eight months. A fair average age would be from three to four months. Seasonal and climatic conditions may be a deciding factor in some areas. Usually branding and castration are carried out on the same day. It is often necessary, however, to castrate bulls from two years of age and upwards for one of the reasons already mentioned.

Materials Required.

1. A good, sharp knife, with a convex blade to aid in cutting through the skin and the scrotum at one stroke. It should be wrapped in a cloth and boiled in water for at least ten minutes prior to first usage.

2. A clean bucket of boiled water which has been allowed to cool, and to which a sufficient quantity (at least 10 per cent.) of a reliable disinfectant, has been added. The knife should be kept in this solution.

3. A bucket of clean water to which at least 5 per cent. disinfectant has been added —for washing the hands of the operator.

4. A clean cloth, on which the operator may wipe his hands.

5. Good, sound 3-inch ropes. The number of these required will depend upon the method of restraint to be used.

6. Artery forceps, also well boiled and kept in a disinfectant solution.

7. In addition to the above, especially with older bulls and where haemorrhage may be great, an emasculator, previously well-heated, in boiling water and kept in 10 per cent. disinfectant solution, will be needed, as it not only crushes and cuts off the spermatic cord at the one time, but also controls the bleeding.

8. A "Burdizzo" instrument is suitable and required, when it is desired to destroy the function of the testes by crushing the cords without cutting the scrotum.

9. If the bulls are valuable, a clean cloth damped in a 5 per cent. disinfectant solution to wipe the scrotum, and tincture of iodine or methylated spirits to smear over the scrotum, are advisable.

Precautions to be Taken.

The fact that bulls, both young and old, have been castrated under dusty and dirty conditions without losses may be attributed to good luck in the avoidance of infection, but, on the other hand, many unfortunate owners have suffered severe losses, chiefly from blood poisoning and tetanus.

The following precautions will assist in reducing losses:—

Never allow cattle to remain in the yards —get them out as soon as possible.

Always insist on strict performance of the instructions to boil the knife for ten minutes and to keep it in 10 per cent. disinfectant solution.

Ensure that ropes and stockyard materials such as gates, rails, etc., are in good order. Faulty equipment is liable to result in injury to man or beast.

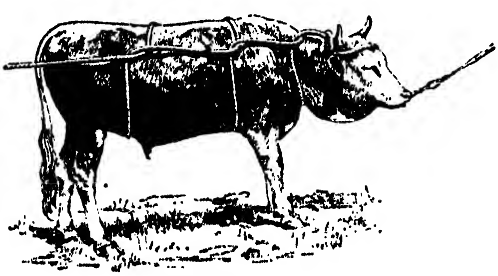
Never sacrifice performance and cleanliness for speed—it is false economy.

Prevent severe bleeding.

Methods of Restraint.

Effective restraint of mature bulls is essential.

The standing position is a popular one, though many aged bulls are castrated on the ground. Whether the bull is in a crush, or tied to a fence or elsewhere, the head should be secured, either by rope or in a bail. It is always advisable—though not often



Methods of Casting Bull.
[*After Dollar.*

done—to secure the hind legs by tying them together to prevent the operator being kicked. Pass a rope in a figure-of-eight fashion around the legs above the hocks.

To prevent the bull from throwing himself down, which some do, one or two ropes can be passed under the body and tied to the top rails or high posts of a crush. If ropes are not available, one or two good strong rails passed through under the body of the beast in the crush will make a good substitute.

If there is no other support on either side of the bull, such as a fence, rails, or crush, one or two strong men can stand on each side of the bull's hindquarters to prevent him moving from side to side.

Another method of restraint is to place a loop of a rope (for preference one with a ring in one end) around the horns of the bull, pull it up taut around them, and then pass the rope back around the neck, making a half hitch. Do the same around the chest and loins. Keep the half hitch along the top of the back. Two or three men then pull on the free end of the rope, when the bull will go down, generally on his side. By keeping the rope taut the bull is unable to rise, and so castration may be carried out.

For convenience, when the bull is on the ground a rope can be passed around both hind legs above the hock, a couple of half hitches made, and the free end pulled backwards, thus drawing the hind legs clear of the scrotum, and out of the way of the operator.

Young bulls can be castrated either in the standing position or on the ground. If standing, then put them in a crush, chute, or press them over against the side of a wall or fence; they are held there by an attendant, while another controls the bull's head. The operation is performed from the rear of the bull—between the hind legs.

If the small, young bull is to be cast or thrown, then this can easily be carried out by the flanking, bull-dozing, or mugging methods. Lassoeing wild bull calves, pulling them to a fence or post, roping the hind and fore legs on the same side, and then pulling these leg ropes taut, is a useful method to control such calves for this operation, when on the ground.

The Operation.

The following is the general procedure adopted in the "uncovered" or "open" method of castration, in which the scrotum is incised, and the testes removed.

In the case of old and valuable bulls, clean the scrotum with the damp cloth previously referred to, and if considered necessary, paint the scrotum with tincture of iodine. However, neither of these two acts is performed to any extent.

The operator takes one of the testes in the left hand, between the thumb and the fingers, and presses it hard up against the lower part of the scrotum. He then makes a firm, bold incision through the skin of the scrotum and other tissues into the testis. This incision should be about 3 to 4 inches long and should extend from the lower

extremity of the scrotum up along its outer side. If the incision has been deep enough, then the testis will be exposed.

Now take the testis in the left hand and draw it out. It will be noted that, attached to that end of the testis away from the blood vessels and cord, is a thin tissue—really the muscle which draws the testis up. Run the knife through this thin tissue, and cut it. Then, in the case of small bulls, or even in bigger and older bulls, scrape the cord well back with the knife, at the same time gently pulling on the testis. In this way, the cord and blood vessels will be severed, and haemorrhage lessened.

If it is intended to crush the blood vessels and cord instead of cutting them with the knife, then the emasculator should be used. To do this, open the emasculator, and place the cord and vessels in it, with the cutting edge next to the testis, and the crushing edge next to the body. Close the emasculator by steady and strong pressure. Keep this pressure up for several minutes at least. The testis will then come away, and haemorrhage will be avoided. Do not remove the emasculator in a hurried or careless manner, as it may cause bleeding.

Having thus removed one testis, proceed to remove the other in a similar manner. If the bull is on the ground, it is always advisable to remove the lower testis first. When the bull is in the standing position, then it would be wise to remove first the testis in the more difficult position. This is generally the one furthest away from the operator. When the bull is standing the operator stands behind him.

Some operators—though they are in the minority—remove both testes through the one incision of the scrotum. Two incisions provide better drainage, if nothing else, and so are productive of better results. Cutting the free end off the scrotum is not recommended.

The "Burdizzo" Method.

This method is named after the inventor of the instrument called a "Burdizzo." It is also known as the "covered way," for in this instance the testes are not removed, but their functions are destroyed.

The operation is usually performed on the bull in a standing position, and usually not before he is three months old. The methods of restraint are the same as those when the knife is used. The operator stands behind the bull, pulls one of the testis well down, and, with the left hand, presses the cord against the outside of the scrotum. The jaws of the Burdizzo are placed over the cord, and the operator proceeds to close the instrument, keeping the cord in position. Once the jaws of the Burdizzo grip the cord, it is closed taut and kept so for several minutes. It is then removed. The same procedure is adopted for the other testis.

Care should be taken to make sure the cord is wholly within the jaws of the instrument before they are closed. If not, the cord will not be properly crushed, and so the operation will be unsuccessful.

After-treatment.

Generally speaking, little or no after-treatment is required in recently castrated bulls, provided the operation has been successfully performed under clean conditions, and no infection of a serious nature has occurred at or subsequent to the operation.

Common complications are blood poisoning, tetanus, and abscess formation. While little can be done for either of the first two conditions, drainage should be provided in the latter condition, by keeping the wounds in the scrotum open, and washing daily in a 2 per cent. disinfectant solution of clean water.

Fly strike may occur, and the application of Stockholm tar about the scrotum at the time of castration will often help to prevent it.

SILENT SERVICE.

Talking will Not Win the War.

It may lose it!

Cockerels Reserved for Stud Purposes.

Poultry Notes.

April, 1943.

E. HADLINGTON, Poultry Expert.

Prepare for the Rearing Season.

WHETHER it is intended to breed from the stock on the farm or purchase day-old chickens it is not too early to make preparations for the coming rearing season.

Last year many poultry farmers were uncertain of the future and delayed making arrangements for the rearing season until about a month later than usual, and then, when egg prices held at a level higher than for many years, attempted to make up the leeway by securing chickens, in some cases up to the end of October. Fortunately for these farmers the summer was unusually cool and the chickens proved fairly satisfactory. The experience of last season should not, however, be taken as an indication that the practice is a safe one, and every effort should be made, under normal conditions, to have the last lot of chickens in the brooders by at latest, the end of September; preferably a week or two earlier.

Planning for this Season.

This year there should be no hesitation about making an early start, but farmers should avoid the other extreme of raising so many early chickens that quality is likely to be sacrificed through having to use a larger number of breeding stock.

Those purchasing chickens should not expect to obtain as many chickens in June as in August, and only in cases where it is intended to raise cockerels for market is there much advantage in arranging for delivery before June. In this connection, it appears likely that there will be a heavy demand for table poultry, but as many more market birds are being raised this autumn than usual, it is doubtful if prices will be as high as last year. However, there should be a firm market for all cockerels hatched up to the end of August, provided that they are well grown and are sold at a stage to suit market requirements. Labour difficulties will no doubt have the effect of curtailing the numbers which might otherwise be raised, following a season of high prices.

The Pullet Position.

While there is, as yet, no official intimation that more eggs are required, the fact that production is lower than last year indicates that there is room for some expansion. However, despite the newcomers into the industry it would appear that the man-power position will restrict any undue increase in flocks.

In the absence of any announcement on production requirements between now and the commencement of the season, the only course to follow is to carry on with a view to rearing sufficient pullets for normal replacements.

It is probable that in some cases where there is a shortage of labour, less pullets will be raised owing to the better returns over the past year, and in such instances it is certainly wiser to reduce than to attempt to raise more chickens than can be given proper attention. Any reduction in numbers of layers thus brought about would probably not materially affect production, because the smaller numbers, given adequate accommodation and attention, might be expected to produce the same quantity of eggs as larger flocks badly managed. In fact, the time has arrived when emphasis should be placed on better management, which would result in a reduction of disease and consequently better returns from smaller flocks.

Commence Preliminary Selection of Breeding Stock Now.

Where the chickens are to be bred on the farm it is advisable to make a preliminary selection of breeding stock as early as possible, and to put more birds in the pens than are required so that a closer selection can be made later, when the numbers can be reduced to the correct levels. If the necessary care is taken a considerable amount of time is required to handle a large number of breeding stock, and it cannot be too strongly emphasised that this work should receive careful attention, for a great deal depends upon the proper selection of stock.

Every bird should be handled and examined for utility qualities, weight and any deformities or serious defects. The weight of the birds is a good indication of physical fitness for the breeding pen. In the case of most light breeds, pullets at 10 months old should weigh not less than 4 lb. and hens at least 1 lb. heavier, while cockerels require to be 5 lb. or more, and cocks 1 lb. heavier. The weights for heavy breeds are a minimum of 5 lb. for pullets and 7 lb. for cockerels, with at least 1 lb. heavier for hens and cocks. Due allowance has, of course, to be made for birds which are moulting or pullets under 10 months old when selected, as they will mostly increase in weight by the time the season starts, but on no account should pullets under 10 months be bred from.

Chickens from Hatcheries.

These recommendations apply equally to the selection of breeding stock for hatcheries, but unfortunately, in many cases, little, if any selection is made other than merely rejecting any decrepit specimens from the flocks. The fact that an increasing number of farmers depend upon the purchase of chickens makes it all the more necessary that hatcherymen should give closer attention to the class of stock used for breeding purposes. Much degeneracy and loss of production results from the indiscriminate mating of stock for the production of day-old chickens, and with the almost general increase in prices for chickens, hatcherymen should give this matter closer attention.

Those who intend to purchase chickens should not leave the ordering of them until the last minute, otherwise they will find that most reputable hatcheries will have been "booked out" early in the season and it will be necessary to depend upon less reliable sources for supplies.

In their own interests purchasers of chickens should make a practice, where possible, of inspecting the farms from which they contemplate ordering, and seeing the class of birds in the breeding pens. Those who give proper attention to selection will welcome this course, and even the inexperienced can form a very fair idea of the quality of the birds and conditions on the farm.

Numbers of Breeding Stock Required.

Many farmers not experienced in breeding their own chickens find it difficult to estimate the number of breeding stock required, and while this will vary according to whether pullets or hens are to be used and the numbers of chickens to be hatched at one time, some guidance can be given to meet these circumstances.

A Section of Single Breeding Pens.

In cases where hatching operations are spread gradually from, say, June to September, it will be found that for each 1,000 chickens to be hatched over that period, sixty to 100 birds will be required according to whether pullets or hens are used. If on the other hand 1,000 chickens are to be hatched in, say, two lots, the number of breeders would vary in accordance with the months in which the chickens are desired. For instance, if 500 are to be hatched in June, at least 650 hens or 450 pullets would be necessary, whereas if the chickens are required in August the numbers could be reduced to 300 hens and about 250 pullets. In these calculations it is assumed that no eggs are kept more than seven days, and allowance is made for rejecting about 25 per cent. of the eggs for various faults such as too small, too large, thin shelled, or abnormal in shape. If a greater number had to be rejected it would be necessary to have more breeding birds.

It will, therefore, be obvious that the larger the number of chickens to be hatched at one time, the more difficult it is to select suitable birds, unless a very large flock is available. For this reason it is preferable to spread the hatchings over the season rather than produce the chickens in large batches. In addition, where large numbers of chickens are raised at one time more rearing equipment is required than where they are run through in small lots. It will readily be understood that hatcheries with only small flocks but which sell many thousands of chickens in a season, have to purchase eggs from other farms.

Management of Breeding Stock.

There are a few matters related to the attention given to breeding stock which make a great deal of difference to fertility and hatching results. One of the first considerations should be to keep the male birds in good condition, and in order to assist in this they should be given a feed of whole maize by themselves at midday. If this is not practicable, as in the case of flock matings, several shallow tins containing maize can be nailed up in the pen at a height which the hens cannot reach. In cases where the male is particularly "gallant," and stands aside while the hens eat the food, it is desirable to feed him separately at each meal. This feeding should be carried out from the beginning of the season, because if the birds lose condition it is mostly impossible for them to regain weight during the rest of the season.

Another frequent cause of loss of condition is infestation by body lice, but if the birds are treated for this parasite when placed in the pens, and, again, if necessary, once or twice during the season, they can be kept clean. One of the simplest methods of dealing with these lice is to paint a thin line of nicotine sulphate along the top of the perches just as the birds are going to roost, or if the hens do not require treatment, which is usually the case, especially young ones, the nicotine sulphate can be dabbed on the perch with a brush under each male after the birds have gone to roost.

It is important that the treatment be not carried out before the birds are actually going to roost, otherwise the fumes will evaporate and not be effective.

Cutting the Spurs.

Cock birds used in the breeding pens should have their spurs cut. This can be done with any fine-toothed saw, such as a hack saw, which is ideal for the purpose.

If an assistant is available he should hold the bird firmly on a table or box with the legs projecting over the edge and in such a position that the sawing can be done readily without injury. The person using the saw should stand behind the bird and hold the spur with one hand while sawing. If no assistant is present the bird can be wrapped in a sugar bag and held between the knees on a box to prevent flapping of the wings; thus both hands are free to do the work.

The spurs should not be cut closer than ½ inch from the leg so as to avoid undue bleeding, but if, in some cases, bleeding does occur, it can easily be stopped by applying a hot iron to sear the cut surfaces.

Showing Where to Cut the Comb and Wattles.

Dubbing.

It is frequently found that second year or older males of the light breeds develop cankerous sores which eat into one side of the comb, causing it to fall over, and in such cases it is advisable to remove the comb to prevent obstruction to the sight when the bird is feeding. However, the indiscriminate dubbing of young males because of weaknesses in the combs is not recommended, as by doing so these faults are perpetuated.

Some breeders make a practice of dubbing all Leghorn males, as they consider it makes them more vigorous, and while this would apply to cases in which the combs are rather large and heavy, the aim should be to breed from birds with moderate combs which do not cause inconvenience.

When performing the operation it is also advisable to remove portion of the wattles as they grow longer after the comb is taken off, and this causes difficulty in feeding, through the wattles dragging on the ground.

To carry out this work, the bird should be wrapped in a sugar bag or strip of sacking, with the head protruding, and the legs held by an attendant who, with the other hand, keeps the body of the bird from moving.

A start is then made by cutting off about one-third of the length of the wattles, following their outline, which makes a neater job than cutting

Method of Cutting Wing to Prevent Birds Flying.

them straight across. Next the comb is cut, starting from the back, curving upwards to the centre and then downwards to the beak.

The exact line of the cut depends upon the formation of the comb; if it is thick at the base it is necessary to cut higher in order to prevent copious bleeding; if thin, the cut can be made closer to the head, but usually about ¾ inch at the highest is found satisfactory.

When the operation is finished it is a good practice to throw the bird a few feet into the air, the shock thus caused having the effect of stopping the bleeding, but if in some cases it is not effective, the application of powdered burnt alum to the cut surface will usually staunch the flow. The birds should be kept by themselves until the sores have healed.

The most suitable instrument for performing the operation is an old blade razor, but if this is not available a safety razor blade firmly fixed in a handle will serve the purpose.

The accompanying illustration shows the line to follow in cutting the comb and wattles.

To Prevent Birds Flying.

In order to prevent breeding stock from becoming mixed it is advisable to cut the feathers of one wing of the breeds which are likely to fly over fences.

The correct method of doing this, to make a neat job, is to cut all but a few feathers on the outer and inner portion of the wing, as illustrated. This does not cause an unsightly appearance, and is just as effective as if the whole of the primaries and secondaries were cut straight across. In the latter case injury is often caused to the fingers when catching birds—by the cut feathers on the outside.

China's Wartime Rural Expansion.

UNDER the stress of war, China has greatly expanded her industrial production. Her greatest problems are, however, still agricultural, according to Mr. H. J. Timperley, an Australian who spent many years in China and is now in Australia as adviser to the Chinese Ministry of Information. Instancing some of the steps taken by the Chinese Government to stimulate primary production—always China's strength—Mr. Timperley stated that twenty-five agricultural training schools and research stations are concentrating directly on improving strains of rice, wheat and barley and on eradication of pests.

Much is being done through rural co-operative and other agencies to introduce better farming methods and secure a higher standard of life for the community. Emphasis is being placed on the training of administrators and other officials to guide rural workers.

As their purchasing power has been steadily increasing, Chinese farmers are actually better off to-day than before the war. The transference of China's industrial enterprises to the interior, creating, as it has, an increasing demand for farm products both for industrial and home consumption, has revitalised the nation's rural economy.

Beekeeping Hints—*continued from page 167.*

property, and his painstaking work, extending over a number of years, has set a very fine example in re-afforestation. The writer, accompanied by Mr. Morris Morgan, visited Mr. Parish on one occasion and observed that trees of value for honey production such as box trees, ironbarks and various gums, were well distributed in planted areas. It was not the first visit made by Mr. Morgan, for his interest in such a venture is well-known to most bee-keepers. Mr. Parish, it is interesting to note, has been most successful in transplanting small seedlings, collected in various parts. He has found that the small seedlings may be removed for transplanting without any significant damage to their tap roots. This point should be of special interest to bee-farmers who have ample opportunity generally to secure seedlings.

Tubercle-free Herds.

The following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
		1943.
F. and C. Ryall, 5 Western Avenue, West Wollongong ...	57	1 April.
McGarvie Smith Animal Health Farm, Liverpool ...	65	1 „
New England University College, Armidale ...	13	1 „
W. Boland, "Seaton," Inverell ...	9	1 „
Parker Bros., Hampton Court Dairy, Inverell	104	1 „
A. D. Frater, King's Plain Road, Inverell ...	106	1 „
R. C. Dixon, Elwatan, Castle Hill (Jerseys) ...	23	3 „
Wollongbar Experiment Farm ...	112	4 „
St. Michael's Orphanage, Baulkham Hills ...	18	5 „
Lunacy Department, Parramatta Mental Hospital ...	31	6 „
A. E. Stace, Taylor Street, Armidale ...	31	7 „
Liverpool State Hospital and Home ...	102	10 „
W. C. Wyatt, Sherwood Road, Merrylands ...	29	12 „
F. C. Harcombe, Hillcrest Farm, Warialda Road, Inverell ...	32	15 „
Grafton Experiment Farm ...	190	17 „
A. C. O'Dea, Perry Street, Dundas ...	28	19 „
Trangie Experiment Farm, Trangie ...	138	19 „
Emu Plains Prison Farm ...	100	20 „
K. W. D. Humphries, "Karoola," Muswellbrook ...	162	24 „
Lunacy Department, Morisset Mental Hospital	80	25 „
H. F. White, Bald Blair, Guyra (Aberdeen Angus) ...	137	26 „
Berry Training Farm, Berry ...	162	31 „
S. E. E. Cohen, Auburn Vale Road, Inverell...	23	12 May.
B. N. Coote, Auburn Vale Road, Inverell ...	53	14 „
J. De Ville, Inverell ...	10	15 „
A. N. De Fraine, Reservoir Hill, Inverell ...	22	15 „
Sir F. H. Stewart, Dundas ...	6	30 „
Cowra Experiment Farm ...	41	27 June.
P. M. Burtenshaw, Killean, Inverell ...	31	27 „
A. E. Liggins, "St. Leger Dairy," Kuring-gai Chase Road, Turramurra North ...	52	7 July.
Kahlua Pastoral Co., "Kahlua," Coolac ...	314	10 „
Lunacy Department, Rydalmere Mental Hospital ...	65	30 „
W. J. Frizelle, Rosenstein Dairy, Inverell ...	76	1 Aug.
W. Budden, "Hunter View," Kayuga Road Muswellbrook ...	18	7 „
T. McLane, Wellingrove, Inverell ...	33	10 „
W. Willis, "Rosedale," Inverell ...	17	13 „
E. L. Killen, "Pine Park," Mumbil ...	252	23 „
A. Hannaford, Braidwood ...	20	26 „
W. S. Grant, Braidwood ...	20	26 „
J. McKenzie, Inverell ...	35	28 „
Farrer Memorial Agricultural High School, Nemingha ...	39	29 Aug.
The William Thompson Masonic School, Baulkham Hills ...	50	29 „

Owner and Address.	Number Tested.	Expiry Date.
		1943.
Navua Ltd., Grose Wold, via Richmond (Jerseys) ...	118	4 Sept.
Australian Missionary College, Cooranbong ...	113	8 „
Department of Education, Gosford Farm Home ...	40	29 „
A. L. Logue, "Thornbro," Muswellbrook ...	46	13 Oct.
Woomargama Estate ...	207	22 „
W. J. Stephenson, "Hill View," Fig Tree ...	57	1 Nov.
Barnardo Farm School, Mowbray Park ...	75	4 „
State Penitentiary, Long Bay ...	10	9 Dec.
		1944.
Limond Bros., Morisset... ...	60	13 Jan.
J. M. Turnbull, "Pastime," Kayuga Road, Muswellbrook... ...	75	15 „
St. Ignatius College, Riverview ...	25	27 „
Department of Education, Yanco Agricultural High School ...	69	6 Feb.
Riverina Welfare Farm, Yanco ...	74	6 „
St. John's College, Armidale ...	30	8 „
C. Wilton, Bligh Street, Muswellbrook ...	75	3 Mar.
N. L. Forster, Abington, Armidale (Aberdeen Angus) ...	188	12 „
Forster and Sons, Abington, Armidale (Jerseys)	87	13 „
Wagga Experiment Farm (Jerseys) ...	81	20 „
Lunacy Department, Callan Park Mental Hospital ...	26	1 May.
T. J. Wilks, "Oaks Farm," Muswellbrook ...	37	5 June.
New England Experiment Farm, Glen Innes (Jerseys) ...	73	27 „
G. T. Reid, "Narrengullen," Yass ...	274	3 July.
Farm Home for Boys, Mittagong ...	49	9 „
St. Vincent's Boys' Home, Westmead ...	26	20 „
Lidcombe State Hospital and Home ...	106	30 „
Hurlstone Agricultural High School, Glenfield ...	37	31 „
Ehsman Bros., Inverell ...	28	13 Aug.
Peel River Land and Mineral Co., Tamworth (Beef Shorthorns) ...	82	28 „
Bathurst Experiment Farm ...	24	9 Oct.
Lunacy Department, Gladesville Mental Hospital ...	34	23 Nov.
Hawkesbury Agricultural College, Richmond (Jerseys) ...	110	18 Dec.
		1945.
The Sydney Church of England Grammar School, Moss Vale ...	51	5 Feb.
Koyong School, Moss Vale ...	2	8 „
New England Girls' Grammar School, Armidale	30	11 „
W. W. Martin, "Narooma," Urana Road, Wagga ...	143	22 „

Tubercle-free Areas.

The following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis :—

Bombala Area.
Inverell Area.
Braidwood Area.

Municipality of Muswellbrook.
Municipality of Queanbeyan.

Max Henry, Chief of Division of Animal Industry.

A Useful Cement Paint.

Cement can be effectively used for many rough painting purposes. For iron roofs, for the interior and exterior of grain silos (particularly when built of black, or ungalvanised, iron) and water tanks, as a priming for new cement, and as a cheap protective covering for rough woodwork, there is nothing better than a mixture of 14 lb. cement and 1 gallon of boiled linseed oil. The mixture should be kept thoroughly stirred and applied in warm weather. Ordinary white lead paint can be applied over it quite successfully.—N. L. Jones, Architect, Department of Agriculture.

Brucellosis-free Herd Scheme (Swine).

LIST OF ACCREDITED HERDS.

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Adams, J. P., "Melton," Daysdale.
Bathurst Experiment Farm, Bathurst.
Boardman, C., Camden.
Campbell, D., Hillangrove, "Wamberal," via Gosford.
Chapman, G. E. and Son, "Illabo Park," Alectown.
Cocks, F. D., "Condalarra," Gooloogong.
Cowra Experiment Farm, Cowra.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., "Glengar," Capertee.
Farrer Memorial Agricultural High School, Nemingha.
Foley, Mrs. E., Bligh Stud Piggery, Water Lane, Rouse Hill.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Holland, A. L., Argonne, Tubbul.
Hurlstone Agricultural High School, Glenfield.
Maybin, N. C., Towac, Orange.
McCaughey Memorial Agricultural High School, Yanco
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Government Agricultural Training Farm, Scheyville.
Shirley, G. F., "Camelot," Penrith.
Smith, J. M., Eulo Glen, Urana.
Stewart, Sir Frederick, "St. Cloud," Dundas.
Wagga Experiment Farm, Bomen.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., "Gwandalan," Grenfell.
Wilson, A. G., Blytheswood, Exeter.
Wollongbar Experiment Farm, Wollongbar.

Herds Other than Registered Stud Herds.

Bathurst Gaol, Bathurst.
Berry Training Farm, Berry.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Croft, H. M., "Salisbury Court," Uralla.
Glen Innes Prison Camp, Glen Innes.
Gosford Farm Home for Boys, Gosford.
Goulburn Reformatory, Goulburn.
Kenmore Mental Hospital, Kenmore, via Goulburn.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital, Orange.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital, Parramatta.
Peat and Milson Islands Mental Hospital, Hawkesbury River.
Pollak, V., Marata, Harrow Road, Glenfield.
Smith, C. W. J., "Norbiton," Canadian Lead.
Stockton Mental Hospital, Stockton.
Waterfall Sanatorium, Waterfall.
Yanco Agricultural High School.

Abortion-free Herds.

THE following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion-free :—

Owner and Address.	Number in herd.
Bathurst Experiment Farm (Ayrshires)	24
Bauerle, P. A., Holbrook	12
Bush, W., Ben Lomond	18
Callan Park Mental Hospital (Aberdeen Angus) ...	41
Carrick, G., "Clonlea," Central Tilba	37
Cowley, L., Redbourneberry, Singleton	56
Cowra Experiment Farm (Ayrshires)	71
Department of Education—Farm Home for Boys, Gosford	36
Department of Education—Farm Home for Boys, Mittagong...	36
Dixson, R. C., "Elwatan," Castle Hill	24
Fairbridge Farm School, Molong	93
Farrer Memorial Agricultural High School, Nemingha	35
Forster and Sons, Abington, Armidale (Jerseys) ...	265
Forster, N. L., Abington, Armidale (Aberdeen-Angus) ...	188
Gladesville Mental Hospital	34
Grafton Experiment Farm (Aberdeen-Angus)	29
Grafton Experiment Farm (Australian Illawarra Shorthorns)	93
Hawkesbury Agricultural College, Richmond (Jerseys)...	108
Hicks A. A., Estate, Culcairn	52
Hill, E. Pritchard, Bowling Alley Pt. (Jerseys) ...	96
Hordern, E. D., Cabramatta (A.I.S.)	95
Hurlstone Agricultural High School, Glenfield	39
Killen, E. L., "Pine Park," Mumbil	223
Leitch, J. F., "Tunbridge," Merriwa (Aberdeen-Angus)	48
McEachern, H., Tarcutta (Red Poll)	9
Martin Bros., "Narooma," Urana-road, Wagga ...	125
Morisset Mental Hospital	80
Navua Ltd., Grose Wold, via Richmond (Jerseys) ...	122
New England Experiment Farm, Glen Innes (Jerseys)	97
New England University College, Armidale	16
Peel River Land and Mineral Co., Tamworth	82
Reid, G. T., "Narrangullen," Yass	171
Robertson, D. H., Scone	82
Rydalmere Mental Hospital, Rydalmere	57
Salway, A. E., Cobargo	95
Skinner, D. S., "Wyworrie," Ben Lomond	38
Smith, Jas. C., Ben Lomond	83
Stewart, Sir Frederick, "St. Cloud Stud," Spurway-street, Dundas	9
Trangie Experiment Farm, Trangie	88
Wagga Experiment Farm, Bomen, N.S.W.	45
Walker, Jas. R., "Strathdoon," Wolseley Park ...	32
White, F. J., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	289
Williams, Chas., Ben Lomond	27
Young, A. H., "Rock Lynn," Cudal (Polled Beef Shorthorns)	12

MAX HENRY, Chief of Division of Animal Industry.

The Agricultural Gazette.

May, 1943.

Women on the Food Front.

IN every mention of Britain's outstanding achievements in wartime agriculture, prominence is given to the important part played by women. It is not suggested that the women of Australia should vie with the women of England merely for prominence of mention in connection with our food front; they should undertake farm work as a national duty dictated by sheer necessity.

There is much evidence to support the view that the Axis Powers hope to achieve victory on the food front, and to date they are making a fair job of it. The danger on this front is not necessarily that of direct food blockade, as in the case of Britain—the attack may be direct; and this is the position with Australia. By maintaining pressure on the ring of islands to our north, the Japanese are forcing our small population to enlist every person possible into the job of resisting that pressure—either in the fighting line or in the munition factories. We have no alternative; and that is the main reason why our food front is so undermanned. By pooling the remaining resources of men and machines much can be done to offset the present difficult position, but the move which offers the greatest relief is the wholesale enlistment of women for farm work.

The Australian Women's Land Army has rendered, and will continue to render, excellent service, but the bulk of our farming areas, especially on the tablelands and coast, require a more flexible land army to meet their labour needs. This has been recognised by the Director-General of Manpower, who has now requested as a matter of urgency that local auxiliaries of the A.W.L.A. be formed in all farming localities.

One such auxiliary has functioned very successfully for the past twelve months in the Armidale district. The organisation, known locally as the W.A.S.P.S. (Women's Agricultural Security Production Service), has a membership of about 140. These women, most of them in various avenues of employment in the Armidale town and district, give an undertaking when joining the W.A.S.P.S., to be available at short notice to help local farmers to sow and harvest their crops. Members of the W.A.S.P.S. journey to and return from their farm work each day, thus solving one of agriculture's big problems—accommodation of workers on the farms. These local auxiliaries service only their own localities and are not called upon to work outside their district. If farmers in every locality in Australia

could be given an assurance along the same lines as that given Armidale farmers by the W.A.S.P.S., namely, "plant what crops the nation wants and will guarantee to harvest them," it would put new heart into our food front and ensure greatly increased production.

Australian women have been accepted for front-line service in our fighting forces, and farmers must not allow prejudices to prevent their serving on the food front. There are some farm jobs women cannot do, but there are almost countless jobs they can perform. The remaining manpower on the farms should accept the heavier jobs and leave to the women those numerous tasks which they are not only willing, but anxious, to undertake.

Successful Direction of Farm Labour.

THE success that has attended the diverting of labour in the Windsor district, from farms and orchards where at the moment it was not vital, to the essential harvesting of the important tomato crop in the same district, has furnished an example of what can be done by organised control of district farm labour.

The men, who were co-opted for interweekly pulling only, since an abundance of volunteer labour was available from the Teachers' Federation and other units for week-ends, worked with enthusiasm, and there was not one absentee. The importance of securing every tomato possible at that time for meeting the needs of army personnel was carefully explained to each of the men, for it was realised that force alone would be futile, without close co-operation and goodwill.

The main objection to the scheme was that some farmers were deprived, for the time being, of farm hands who were engaged in the preparation of land, etc., for the planting of winter maturing crops. In order that the effect of this should be as little as possible the drafts were limited to a fortnight in duration. This, of course, meant co-opting a larger number of men from a larger area.

The rate paid was 1s. per packed case not graded, with a minimum of 15s. per day, and the unskilled packer would average about fifteen cases a day in a normal crop. One co-opted man pulled forty-three cases in a day, but this was the work of an expert. However, it proved that skilled labour is economical, especially since an inexperienced hand unconsciously damages the fruit and the vines.

If longer term planning of utilisation of local labour were carried out, not only for tomatoes but for all crops, especially for harvest work, the systematic diversion of labour from within the ranks of the farmers and their employees would accomplish a great deal more than many think possible. If such a scheme as that carried out in the Windsor district in the past few weeks had been planned about two months ago and the labour earmarked for the harvesting of these tomatoes, the element of surprise and unpreparedness would not have been present, and a great deal would have been done by the farmers themselves in anticipation of the scheme being put into operation. It is vital to the success of such a scheme, of course, that the farmer and his employees on the property where the essential work is to be carried out should themselves be engaged in it.

The direction of this type of labour effectively has hitherto been regarded as beyond accomplishment. The results of this experiment, however, have demonstrated otherwise; it has been shown that, given sound local organisation and planning, experienced farm labour can be used more efficiently in the nation's interests than has been the case previously. A practical demonstration has been given of what—failing co-operation by farmers—directional methods can achieve.

Superphosphate Rations—Adjustments to be Made Next Year.

UNDER current superphosphate rationing arrangements, wheatgrowers and graziers in this State who draw supplies from New South Wales merchants are receiving 70 per cent. of the quantity purchased during the 1941-42 season. Those drawing supplies from Victorian firms are receiving 55 per cent., which is the quota in Victoria. This difference in quotas is due to each State being permitted to formulate its own plans with regard to the disposal of superphosphate to growers of non-priority crops.

In order that such border anomalies will be avoided in future the Agricultural Council, at a recent meeting, agreed that as from 1st July next, certain adjustments should be made in the methods of arriving at quotas for various crops. As a result farmers in this State will all be on exactly the same basis during the next rationing year, irrespective of the source of supply.

Apparently this decision has created the impression that adjustments would be made immediately in the rations of farmers drawing supplies from Victoria in order to bring them up to the 70 per cent. received by farmers drawing supplies from New South Wales merchants. Such adjustments will not, however, be made during the current rationing period, as the supplies of superphosphate available would not permit such action.—A. W. S. MOODIE, New South Wales Fertiliser Rationing Officer.

Control of Rural Labour

By the Manpower Directorate.

Answers to Questions that Producers are Asking.

A SESSION of the recent conference of executives of war agricultural committees held at Gunnedah, was devoted to the problems of rural manpower, and delegates asked many questions that are no doubt in the minds of producers in other parts of the State. The answers given to these questions by Mr. K. G. Carn, Superintendent, Rural Section, New South Wales Manpower Directorate, should help to make the position clear and so overcome difficulties that are at present confronting many farmers and graziers.

What is the present position in regard to call-up for rural workers, for either military or Allied Works Council?

A bona-fide rural worker engaged full time in the production of wheat, wool, meat, fruit, vegetables, dairy produce, cotton, tobacco, rice, honey, eggs and sugar, cannot be called up for military service or Allied Works Council, irrespective of age, at present.

Can men who are engaged in rural production enlist in the services?

When fully engaged they may not enlist, except those who qualify for air crew in the R.A.A.F.

Can a man move freely from rural work to other employment?

No. He must first secure a clearance from the National Service Officer. Only in very exceptional circumstances, such as health reasons, would this transfer be sanctioned.

Should primary producers report a rural employee who does go to employment other than in agricultural primary industries?

Yes. Help the Manpower Directorate as much as possible in that way.

Can a rural employee go to another rural job?

Yes, but I think Manpower will have to do something about that, in the case of permanent rural labour.

What is the position of boys arriving at military age—are they prevented from enlisting?

It does appear unfair to stop them unconditionally, but the present serious conditions warrant this drastic move.

In the event of a rural worker being called up, what action should be taken by a local W.A.C.?

First of all be sure it is a call-up. False information wastes much time. Often young men are called for medical examination and classification. This is not a military call-up. In these cases they should be sent along with a clear statement of what they are doing—and if fully engaged in rural production they will be deferred. In the case of a call-up for military service, immediately inform the District War Agricultural Committee or the National Service Officer, who, in any case, is a member of the D.W.A.C. The D.W.A.C. should immediately inform the National Service Officer, stating the facts as they stand. He will take the necessary action with the Military Authorities.

Is it possible for rural workers to be employed on the railways?

No.

Is it possible for rural workers to undertake work in munition factories?

No.

Where do farmers apply for labour?

All requests for labour should be made to the local W.A.C., which should convey them to the District W.A.C. If the D.W.A.C. is unable to supply the labour, it will immediately inform the National Service Officer. Where the work is of an unusual nature, this request is generally immediately conveyed to the Executive Officer of War Agricultural Committees for the necessary assistance.

What action should the local W.A.C. take on receipt of an application of a farmer for labour?

The local W.A.C. should do as much as possible locally, then ask the help of the N.S.O. The N.S.O. may be able to get men from other districts under present powers. Crops maturing at varying times in different districts give some scope for this. Cases have already occurred where "hundreds of men have been temporarily transferred to a particular district." The local War Agricultural Committee may make direct contact with the N.S.O. on such matters, since the N.S.O. is, in any case, on the District W.A.C.

What procedure should be adopted in making requests for assistance from serving soldiers?

This should be the last resort, and then only skilled key men should be asked for. The application should be to the Local National Service Officer, stating:—

a. Size of farm.

b. Area of crops and stock.

c. Work to be carried out.

d. Names, age, health of all people on the farm.

e. A statement from the W.A.C. that all attempts to obtain labour have failed.

f. Number, rank and name of soldier.

g. Time required as leave without pay.

There is no need for further lengthy letters. The War Agricultural Committee may be asked by the N.S.O. whether the case is authentic and to certify that the farmer has applied for labour and none is available.

The soldier must also apply.

If full release of soldiers is required what procedure should be adopted?

In this case the soldier is making the application on the grounds of hardship—to himself or his dependants. The soldier must apply to his C.O.—and he must also do this in the case of seasonal leave—before the Military will consider Manpower's approach: In the case of hardship the soldier may use forms 9 and 37, which are for that purpose. It is not absolutely essential, but the dependants can apply for the soldier. The case eventually comes to the National Service Officer, who has to give a detailed statement on the business side of the farm, any changes in the property, and a complete list, with ages, of all people on the property. Also the National Service Officer must give a statutory declaration that there is no man available to do that job.

What has been done to protect shearing and other skilled rural labour?

They have been registered on the seasonal workers' register and, provided they stay in some rural occupation for the remainder of the year, they are protected against call-up for Military Service or Allied Works Council. This applies to shearers, cooks, wool classers, rabbit trappers, chaff-cutter gangs, wheat lumpers and receivers, silo engine drivers, wool and skin buyers. Some of these classes are reserved only when the men are over 35 years of age.

What is the position of wool pressers?

If the man is over 35 he is exempted, and if he works full time in rural industries he is exempted, irrespective of age.

If a shearer is shearing, say, only three months a year, is he exempt?

Yes, if the rest of his time is in a skilled occupation.

Re professional destroyers of rabbits—is that vocation sufficient for a man to be exempted?

Yes, if the man is registered as a skilled rabbiter.

Could, for instance, a skilled shearer change to rabbiting?

Not if he was wanted at that time for shearing.

How is the Womens' Land Army controlled?

This organisation to assist farmers is entirely controlled by Manpower. Any farmer wishing to employ Land Army girls should apply to the National Service Officer, who will give all details, set out the required standard of accommodation and requisition Head Office for the required number of girls. These girls are recruited from those not gainfully employed, and exclude those girls already working on the land. When they join they must resign themselves to discipline and go wherever sent by Manpower. They are issued with overalls, boots and uniform. A local auxiliary of the Women's Land Army has now been established. Girls are asked to enrol for emergency work in the local district, and to be on call when required by farmers. For any question concerning the Women's Land Army ask your War Agricultural Committee to get the information or see the National Service Officer yourself.

What procedure should be adopted by the D.W.A.C. wishing to obtain Women's Land Army labour, and what obligations are on the committee in this respect?

We want the D.W.A.C's. to regard the N.S.O. as the immediate source of information and advice on any problems concerning W.L.A.; *e.g.*, whether a property warrants employment of the women, whether accommodation is satisfactory, etc. The N.S.O. is a member of the D.W.A.C. and these are amongst his functions on that Committee.

**What assistance, if any, is available to D.W.A.C's. for the provision of transport for the W.L.A. or other workers?*

Arrangements exist with the Road Transport and Liquid Fuel Control authorities for buses or other suitable transport to be engaged and for provision of petrol. A circular re W.L.A. transport was sent recently to W.A.C's.

**Who is responsible for provision of accommodation for seasonal farm workers?*

The farmer primarily. But the executive for W.A.C's. has assisted Local W.A.C's. in several cases on a 50-50 basis, with money made available in special cases by Department of Commerce and Agriculture. In one case a hall was reconstructed to provide accommodation, at a cost of £240, of which we provided £120 and the local people £120. In other cases, as at Oberon, we supplied tents. All reasonable requests are given sympathetic treatment.

Have any steps been taken to overcome the shortage of tutors or governesses in remote country centres?

The Women's Employment Section of Manpower Directorate informed me yesterday, that there are no tutors or governesses available. The position as to availability of female labour is as serious as male labour.

Would it not be an advantage if "off-siders" on lorries were eliminated and used for other necessary work during the acute manpower shortage?

D.W.A.C's. and N.S.O's. could look into this, but the "tigers" or "off-siders" are not, as a rule, loafers. They need rests. Manpower Directorate will, of course, keep the question under attention for next wheat season.

What is the position with respect to the payment of fares for seasonal workers sent by Manpower to work in rural districts?

This is difficult to answer. It depends on individual circumstances. Leave the fares question to the D.W.A.C. and the Central Executive for W.A.C's. to clear up as specific cases occur.

(*Continued on page 215.*)

* These questions were answered by Mr. C. C. Crane, State Executive Officer for War Agricultural Committees.

Oat Varieties Grown in New South Wales.

Brief Descriptions.

J. T. PRIDHAM, Plant Breeder.

FOR most domestic animals the oat crop provides excellent grazing in winter; oaten silage is a good succulent feed, the crop being one of the most suitable for this purpose, while oaten chaff is considered to be one of the most nutritious of all cereal chaffs, due, to a certain extent, to the higher percentage of grain present. No other cereal grain is nearly as well balanced in nutrients as oats, which is an excellent concentrate for horses, can be fed satisfactorily to dairy cattle and is highly esteemed as part of the concentrate for sheep in times of drought.

The following brief notes on the varieties recommended by the Department for growth in different districts and for different purposes should prove helpful.

Algerian.

This is still the best variety for districts of good rainfall, as an all round oat for grazing, for hay and for grain to be used for stock or as breakfast food. The recovery power after grazing is good, and when shut up to produce a crop of hay, the purplish straw is fairly slender and of good length, cutting an excellent sample of chaff. The grain is of good size, brown and plump, with a rather high percentage of kernel to husk.

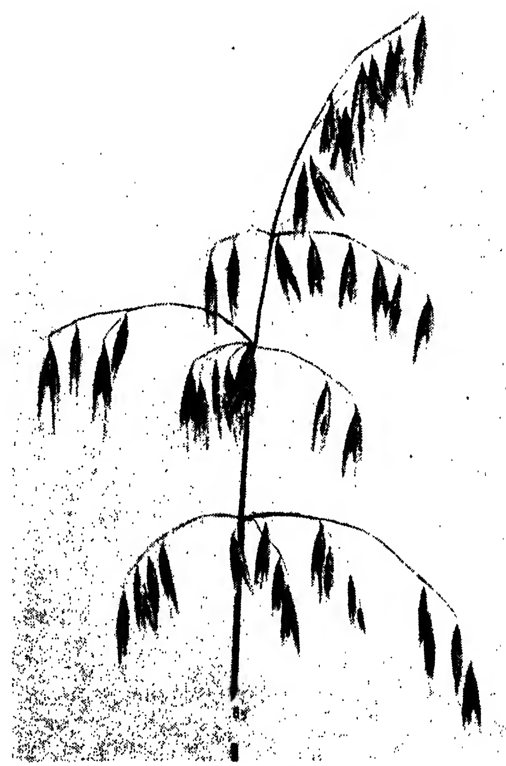
Many strains of Algerian have been tested from time to time, some earlier and many later than the type now generally grown. The "College" Algerian selected in New Zealand is later maturing than the ordinary but has not yielded as well on the Department's Experiment Farms.

Algerian is classed as a late maturing oat and is susceptible to stem rust and moderately resistant to smut. It is recommended for grazing in all districts except the Western Plains and Western Riverina; also for general purposes in all but the last-named districts.

Belar.

This is a selection from Sunrise oats made at the New England Experiment Farm in 1918. It is a good general purpose oat, midseason ripening and moderately suitable for grazing. The straw is tall and not coarse, with a tinge of purple and cuts a good sample of chaff. The grain is brown, medium sized and plump, with a fine awn, providing an even grade for milling purposes. Belar is resistant to oat smut and is moderately resistant to stem rust. It thrives in a wide range of inland districts of fair rainfall, and is acceptable in coastal areas.

This variety is recommended for early green fodder on the South Coast, and for grain, hay or silage on the North West Slopes, Central West Slopes, South West Slopes and Eastern Riverina, Western Plains and Western Riverina and the Murrumbidgee Irrigation Areas.



Panicle of Algerian.
Note the rachis leaning slightly to one side at the tip, and the drooping branches.

Buddah.

Buddah is a selection from Sunrise made at Cowra in 1916. It is very early, with mid-tall straw which is not coarse. A sparse stooler inland, Buddah gives a better account of itself in the coastal districts, recovering fairly well there after grazing. It has straw slightly stronger than Sunrise and Mulga, and has been favourably reported on from California. It is rather resistant to stem rust and smut. The grain is a creamy to pale brown colour with a medium coarse awn.

The variety is only adapted for the drier districts inland and for the coast, where it is preferred for the production of early winter fodder. Buddah is recommended for early green fodder on the North and South Coast and for grain, hay or silage on the North West Slopes and Upper Hunter.

THE SEED OAT SUPPLY.

GROWERS *are advised to buy a small lot of pure seed from time to time from a certified pure seed grower or a Government Experiment Farm. Varieties are apt to vary and deteriorate if grown too long without selection.*

The colour of seed oats is not to be too much relied upon; grain grown in a warm dry district is paler in tint than the same variety grown in a cooler district of good rainfall.

For milling purposes the manufacturer desires an oat with a small percentage of pin or small kernels. The sample should be plump, of even appearance and comparatively thin husk.

Where farmers do not run stock, it is advisable to grow a variety with good straw but also adapted to the requirements of the district.

Oats with tall or weak straw should be grazed in order to avoid risk of lodging later on.

Burke.

This variety is a selection from Kherson which came originally from Russian Turkestan, and was introduced into Australia from America. It was received by this Department from the Roseworthy Agricultural College, South Australia, in 1926, and the strain selected from it was named Burke in 1928.

Burke is a midseason to early variety, with slender, somewhat short straw. It is a good grazing oat, resistant to stem rust, but susceptible to smut; it is chiefly valuable for grazing and home use as fodder in the form of hay and grain. The grain is creamy-white, small and not attractive, but has a decidedly thin husk and is consequently of good feeding value, though not desirable for milling.

Burke is recommended for grazing, grain, hay or silage on the North West Slopes, Central West Slopes, South West Slopes and Eastern Riverina, Western Plains and West Riverina and the Murrumbidgee Irrigation Area.

Fulghum.

Fulghum is an American variety, originating as a farmer's selection from a crop of Red Rustproof and appears to be the result of a natural cross.

It is an early variety, with weak straw, but it stools well and is unsurpassed for grazing. Fulghum is susceptible to smut and stem rust, but is quite winter-hardy in cold districts. It has brown, plump grain with a very fine awn and mid-tall straw.

A number of strains of this oat have been selected but the original type is as good as any and well suited to grazing; the weak straw being an element of risk for hay and grain production. It is recommended by the Department for grazing in all districts.

Gidgee.

An oat raised at Cowra Experiment Farm in 1920 from the crossbred White Ligowo x Algerian. It is very early, with tall, medium-coarse, straw, purple-tinted. The grain is brown with a coarse awn, very plump and of medium size with medium thin husk.

Gidgee is recommended only for the Western Plains and Western Riverina and the drier parts of the Central Western Slopes. It is not suitable for the coast because of its susceptibility to stem rust; it is resistant to drought but not suitable for grazing.

Lampton.

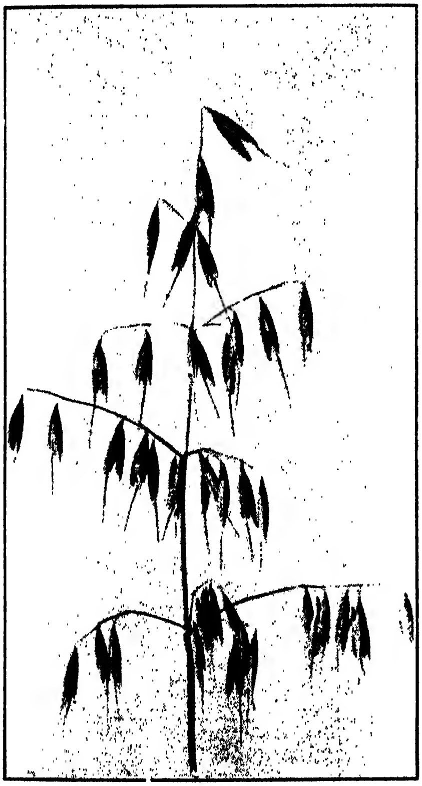
A late maturing oat, resistant to stem rust and smut, but not well adapted for grazing. This variety was produced at the Cowra Experiment Farm from the crossbred Abruzzes x Victory x Reid; it yields brown, plump grain with fairly coarse awns and tall, medium slender straw.

It is recommended for autumn sowing, for grain or hay on the Northern, Central

and Southern Tablelands, and also for spring sowing in those districts.

Mulga.

A selection from Sunrise made at the Cowra Experiment Farm in 1917. It is very early, more resistant to stem rust than Sunrise, but susceptible to crown rust; it is highly resistant to smut. Mulga has medium



Sunrise.
This variety has a large spreading panicle of the pyramidal type with an erect rachis.

tall, rather fine straw and pale-brown or creamy, plump grain with medium coarse awn.

It does not recover well after grazing, except on the coast, and is recommended for early green fodder on the South Coast and for grain, hay or silage on the North West Slopes and Upper Hunter; also on the Western Plains and Western Riverina.

Sunrise.

Originated in 1910 from a selection in a crop of Algerian oats. This variety, and the types subsequently selected from it, show an occasional dark or black seed. This is a "false" wild oat and is met with at times in some other varieties, being the result of natural crossing and not a throwback to the wild oat as some have thought.

Sunrise is very early, with quite tall, medium-coarse straw and large, plump, white grain carrying a rather coarse awn and a thin husk. The variety stools poorly, but is recommended for early green fodder on the North and South Coast districts. Sunrise is resistant to stem rust, and smut.

White Tartarian.

A very late oat introduced from Europe and recommended only for spring sowing in the tableland districts. It is susceptible to stem rust and smut and has definitely coarse straw of medium height. The white grain is rather small and has very fine awns. It is unsuitable for grazing.

Panicle of White Tartarian.
The panicle of this variety is unilateral or one-sided.

Farm Tenancy in New South Wales.

The Agricultural Holdings Act, 1941, and its Application.

A. W S MOODIE, H D A , H D D , Senior Agrostologist.

The Background to the Act.

THE Agricultural Holdings Act, 1941, which will be proclaimed on 1st July, is of vital interest to tenant farmers, sharefarmers and landlords, but all primary producers should know something of its provisions and its objectives. The future of this country is dependent upon our ability to maintain and increase the fertility of our soils. Superficially the Agricultural Holdings Act appears to be designed to regularise tenant farming, but it has a far deeper significance, inasmuch as it represents an attempt to rationalise a system which is responsible for the exploitation of farming lands for the benefit of individuals. Such exploitation affects the interests of the entire community, not only of this generation but of future generations.

It is proposed to discuss the Act in this and in the next few issues of the *Gazette*. This month the facts of tenancy and sharefarming in New South Wales, and their influence on the trend towards the development of soil exhausting practices are set out, while future sections will be devoted to an outline of the Act in non-technical terms; the rights, responsibilities and privileges of tenants, sharefarmers, and landlords; practical aspects of the procedure likely to be followed by the Agricultural Committees set up under the Act to deal with claims for compensation for improvements, for disturbance and others matters, and for the adjustments of rents: method of assessing the values of farm practices, unexhausted values of fertilisers, stored fodders, etc.; the procedure to be followed by the parties to any dispute which may arise between the tenant or sharefarmer and the landlord; and suggestions for improved forms of agreement.

THE Agricultural Holdings Act, 1941, has been designed to provide a modern legal background for the relationship between landlords on the one hand and tenants and sharefarmers on the other Any effort to improve such relationships involves consideration of three closely inter-related aspects, viz —(1) the business or economic, (2) the technical; (3) the legal

For a system of tenancy and sharefarming to function satisfactorily and smoothly it is essential that the rights and obligations of both landlord and farm operator should be defined as clearly as possible.

The majority of farm tenants and a great many landlords know very little about the legal aspects of the landlord-tenant relationship The Rural Tenants Improvement Act was passed as far back as 1916, yet very few tenant farmers were aware that under its provisions they were entitled to compensation for effecting certain improvements Many signed tenancy agreements purporting to nullify their rights to compensation under this Act unaware that such clauses were valueless The Act of 1916 was ineffective largely because it was not publicised and tenants were not informed as to the benefits conferred upon them

It is claimed that the standard of husbandry associated with the operations of tenants and sharefarmers has declined alarmingly, simply because operators have been prevented from implementing a long-range constructive programme by their inability to recover compensation for improvements at the termination of tenancies which frequently were of short duration. That such a situation has arisen is due more to the tenant's ignorance of his legal rights, rather than to any other cause, with the possible exception of failure on the part of many landlords to realise that it was to their own interests to encourage a high standard of farming

The Present System of Farm Tenancy.

For many years field officers of the Department of Agriculture have stressed the evils of certain aspects of the system of tenant and sharefarming existent in this State, and have drawn attention to the manner in which it retarded the adoption of modern methods of husbandry The exploitative form of agriculture followed, a natural corollary of the system, has resulted in depletion of soil resources and a steadily diminishing volume of business on many farms

Condemnation of the landlord-tenant system was expressed in the report of the N S W Select Committee on the Agricultural Industry, 1921 Referring to the dairying industry, it stated, "In the best of cases the tenant farmer is not, under existing conditions, likely to do much in raising the industry to a higher plane of efficiency He has very little incentive, if any" The Federal Dairy Investigation Committee in 1930 reported that "tenant and sharefarming are having a retarding influence upon the industry."

What is Farm Tenancy?

Farm tenancy as an institution may be traced back to times immemorial. The principle of one man with capital invested in land and another with capital invested in plant and equipment joining forces for their mutual benefit has long been recognised. The renting of land is a practice

followed in all agricultural communities, and in some of the most highly developed communities the renting of land is the rule rather than the exception.

Sharefarming is a survival of the old manorial system. The landowner provides the land, livestock, and the equipment, and the produce of the farm is divided in fixed shares between the owner and the operator. Actually it is the association of capital and labour. In most cases the landowner is the predominant partner in the joint business.

Farm tenancy properly conducted is a desirable means of combining the forces of capital and labour for mutual benefit. Many tenant farmers prefer to invest their capital in machinery and equipment rather than in land, and if the conditions governing tenancy are equitable and the tenant is efficient, there is no reason why the arrangement should not be successful. Similarly, sharefarmers without capital are able to obtain a good livelihood if their methods are efficient, and if both parties to the contract fulfil their obligations. Tenant- and sharefarming, conducted under reasonable conditions, afford a means by which individuals, by the exercise of technical skill and business ability, can accumulate sufficient capital to become landowners.

It is probable that tenant farming will always constitute a part of our agricultural system. Whilst operator ownership may be advanced as an ideal, it is necessary to remember that some farm operators have no desire to possess their own farms, preferring to work under the guidance of an experienced landowner; unable to accommodate themselves to the business aspects of the undertaking they fare better when relieved of such responsibilities.

Under ideal partnerships between landlords and tenants it is frequently possible to devote more capital to improvement and development than under operator-ownership. Instead of the landowner possessing equipment and stock, he is able to invest his resources in directions designed to improve the productivity of the property. Under conditions conferring the right to compensation for improvements and security of tenure, the tenant is also encouraged to invest his savings in the farm with a view to increasing the volume of business.

Tenancy and Production Statistics.

In New South Wales at least 36 per cent. of the dairy farms in coastal districts are operated by tenants and share farmers. In the wheat-growing industry sharefarming is common, but tenant farming is of little significance. Evidence supplied by numerous tenants, sharefarmers, and landlords, leaves no doubt that the prevailing system is capable of immense improvement. Almost revolutionary changes would be necessary in the relationships between some landlords and tenants in the dairying industry to check effectively the soil impoverishing methods employed.

The volume of production on many dairy farms in coastal districts is limited by factors such as inadequate feeding of milking stock during the winter months and during dry periods, by failure to maintain the fertility of grasslands and cultivated areas, by insufficient subdivision of holdings, and by lack of interest in herd testing and improvement.

The totally inadequate arrangements for feeding stock are revealed in statistical evidence. According to the Statistical Register for 1940, dairying is the principal avenue of production on 13,209 farms in coastal districts. In addition, dairying is supplementary to grazing or agriculture, or both, on another 3,759 holdings. Thus, the total number of holdings on which dairying is conducted is 16,968. The number of farms on which silage was conserved is recorded as 758, or 4.52 per cent. The total amount ensiled was 52,815 tons, equivalent to 123 lb. per head for the 958,308 milking cows in the division concerned. The hay saved totalled 44,881 tons, three-quarters of which was lucerne, a considerable proportion being produced for sale rather than for feeding to milking stock on the holdings concerned.

In the North Coast section of the coastal division, where the total number of holdings devoted to dairying is 8,746 and where the percentage of

Perennial Red Clover Established on Old Paspalum Pasture to Provide Winter Feed.

A practice that should be encouraged by landlords.

tenant and sharefarmers is probably greater than in other sections of the coast, the number of farms on which silage was made was 84 or .96 per cent., the total amount being 7,032 tons or 36 lb. per milking cow. The quantity of hay made in this section was 5,586 tons or 28 lb. per milking cow.

The State averages of 145 lb. of butter fat per cow, and 150.6 lb. butter fat per cow for all cows tested under the herd improvement scheme conducted by the Department of Agriculture, illustrate the necessity for greater attention to feeding and to herd improvement.

In inland districts soils are diminishing in fertility and soil erosion is displaying alarming aspects on large sections of wheat-growing country On the coast the number of holdings on which fertilisers are used on pastures, and on crops in quantities sufficient to replace the plant foods removed in cropping and the production of milk, represents but a small percentage of the total number. That treasured possession of the European farmer, the manure or compost pile, is an unknown quantity on local farms and millions of tons of animal manure are allowed to go to waste every year, few farmers troubling even to harrow their pastures to distribute the droppings.

Influence of the Present System on Production Generally.

It must not be inferred that tenant farmers and sharefarmers are considered to be solely responsible for these obvious deficiencies in our agricultural technology. However, with 36 per cent. of the holdings devoted to dairying in the hands of tenants and 1,425,636 acres of crops, including wheat, grown by sharefarmers, the system must bear a share of direct responsibility. The most disquieting aspect of the situation is that the exploitative methods followed by many tenants and sharefarmers with the tacit approval of landlords, and their failure to embrace modern methods, must and does tend to retard widespread acceptance of such principles by the farming community as a whole

In its endeavours to interest coastal farmers in improved technical practices the Department of Agriculture is handicapped severely by the landlord-tenant system. Recommendations regarding methods of cropping designed to maintain and augment soil fertility, the necessity for greater subdivision of pastures, and the use of fertilisers and lime are often accepted in principle by tenants and sharefarmers. That they fail to adopt them is explained by the circumstances governing their tenancies.

Farm Tenancy and the Community.

It is quite apparent that as a community we fail to give adequate consideration to the effects of current practices on the future productivity of farm lands. The future of our agricultural structure depends upon the realisation that farming systems must be designed to provide for the stability of our agriculture in addition to meeting immediate economic requirements. Continued productivity of the soil is fundamental to our national existence and farm programmes must be designed accordingly. Landlord-tenant agreements can perform an important function in this regard. Instead of such agreements being confined to matters that would be expected in contracts between landlords and tenants of city dwellings, they must be changed radically to include details of the cultural programme, and the measures to be adopted to conserve soil fertility.

Farm tenancy is a matter of vital interest to the community. The exploitative form of agriculture so commonly adopted by tenant farmers results in a steadily diminishing volume of production. The inevitable corollary is a gradual contraction in the volume of business in country villages and towns. Business and professional men and townspeople generally are involved in this reaction. Apart from this general aspect, the fact that tenant farmers often work with a minimum of equipment, fail to use fertilisers and certain classes of seeds, and seldom carry out improvements for which fencing and building materials are required, is directly responsible for loss of business. Considered from these angles alone, it is obviously

Making a Silage Stack—an Unusual Sight on a Tenant-operated Farm.

to the interests of the community that tenant farmers, who purchase most of their requirements in country towns, should follow modern methods designed to increase production and to maintain soil fertility.

Of even more concern, but possibly of less immediate interest, is the effect of a soil-exploiting form of agriculture on future generations. "Land is the heritage of each generation which is responsible for handing it on to future generations with unimpaired fertility." The future of this country rests upon recognition of the fact that soil fertility is not static, and each succeeding generation must contribute its share towards maintaining and improving soil fertility.

The Landlord-Tenant Relationship.

Recognition of the fact that their interests are mutual is the only possible basis for successful landlord-tenant relationships. If each party to a

contract would look upon himself as a partner in a joint enterprise, many unfortunate incidents and disagreements would be avoided. The spirit of antagonism between landlord and tenant often met with, is due very often to the absence of a properly designed written agreement. The rights and obligations of each party, instead of being clearly defined prior to the commencement of the tenancy, are discussed as the tenancy progresses and frequently there is a steady deterioration in the situation until ultimately a break occurs. In some quarters there is a strong averson to written agreements. Experience all over the world indicates that the most successful landlord-tenant relationships are maintained where properly drawn up agreements are in existence.

Tenancies in New South Wales are commonly covered by written agreements, but as far as could be ascertained in a somewhat restricted survey, sharefarming arrangements, especially in the dairying industry, are usually verbal.

The usual type of agreement governing tenancies is quite unsatisfactory. It generally consists of clauses dealing with matters such as the right of the landlord to have access to the property at all reasonable times, repairs to buildings, white ants in buildings, control of noxious plants, rabbits, etc. The tenant covenants to cultivate and manage the property according to the principles of good husbandry, which incidentally, are not defined, to comply with the provisions of the Dairies Supervision Act, that he will not allow artificial grasses to become depleted, and that he will pay all fees levied by the Pastures Protection Board. A most unjust clause often found is one stipulating that all improvements and fixtures erected by the tenant shall become the sole property of the landlord at the termination of the tenancy.

The Rural Tenants Improvement Act, 1916, provides that fixtures and buildings affixed or erected by a tenant for which he is not entitled to compensation or is bound to effect under his tenancy agreement, are to become his property upon the determination of the tenancy. Unfortunately the Act did not prevent contracting out of this right, and many tenants have done so.

The tenant's rights to compensation for improvements under the Rural Tenants Improvements Act, 1916, are often dealt with by a clause limiting the amount of compensation (if any) payable by the landlord to one shilling, or some other nominal sum.

Notable omissions from such agreements are clauses to safeguard soil fertility, the landlord's greatest asset, and to encourage the tenant to follow a high standard of husbandry. Matters such as the treatment of grasslands and the use of fertilisers are seldom, if ever, mentioned.

Under some agreements the tenant covenants to assume responsibility should reconstruction of buildings be ordered under the Dairies Supervision Act; under such circumstances he seldom receives compensation.

The Duration of Farm Tenancies.

Tenancies vary considerably in their duration. The majority are not for any fixed period and are classified as tenancies at will; some are for one, two or three years, with a very small percentage for longer periods. Tenancies at will are terminable at short notice from either party. The same position exists with sharefarming; agreements for an unfixed term are most common.

Generally speaking, the majority of existing agreements are very unsatisfactory, particularly in view of the lack of adequate and reasonable provision to compensate tenants for improvements or for disturbance of tenure. The fact that leases are for short periods would not be very important if the tenant received compensation for improvements, for conserved fodder and for using fertilisers and lime. Therein lies the basic weakness of the existing system.

Insecurity of tenure tends to restrain the tenant in acquiring equipment for conducting farm operations efficiently. Every item represents additional expense in the event of moving to another property; consequently the average tenant operates with a minimum of equipment.

A practice common in some districts and one with highly objectionable features is tendering for farms. Under this system the rent of the farm for a specified term of years is decided by inviting tenders. In the case of a desirable property, competition is always keen and the successful tenderer is called upon to pay a high rent. He enters into possession fully aware that tenders will be called again at the termination of his lease, and that any improvements he may make will result in increased offers from competitors. Should he wish to embark on a new term of tenancy, he will be compelled to pay an increased rent because of the improvements he has himself effected and paid for. This system definitely encourages exploitative farming and is responsible for rapid deterioration in soil fertility.

The practice of dealing in "going concerns" is prevalent in a few areas. To obtain a farm the prospective tenant is compelled to purchase the stock and plant — sometimes at an exorbitant figure — which is, in effect, a premium on the lease. Incidentally, he may be forced to acept stock of inferior quality. At the expiration of his lease he may have to auction stock and plant under circumstances adverse to a sale on favourable terms.

Security of tenure is recognised as fundamental to any stable system of tenant farming. Such security need not depend solely upon long term leases, which if observed faithfully are binding upon the tenant as well as on the landlord. Security of tenure is usually attained when the tenant is accorded reasonable freedom of action in his farm operations, and when he can invest savings in improvements for which he will be compensated upon quitting the property. In other words, under conditions that will permit him to act as would an owner-opeartor. The provision of compensation for disturbance under the Agricultural Holdings Act, 1941, is designed to provide an additional measure of security.

Sharefarming.

This form of landlord-tenant agreement is very popular in New South Wales, especially in the dairying and wheatgrowing industries. The sharefarming agreement provides for the proceeds of farm operations to be divided in fixed proportions agreed upon beforehand. In dairying a common arrangement is for the income from milk or cream and pigs to be divided equally between landlord

and sharefarmer, the latter being allowed sums varying from 2s. 6d. to 10s. per head for all female calves raised The landlord usually supplies the farm, plant and stock, and may supply half the seeds and fertilisers used. In some cases the sharefarmer receives one-third or two-fifths of the proceeds of the farm; very rarely he may receive as much as three-fifths.

Some sharefarmers operate under the direct supervision of landlords who assist the sharefarmer in every way possible. In many cases, however, the farms are operated on behalf of absentee owners, who rely on the sharefarmer's ability and judgment. There does not appear to be any definite ratio between the responsibility assumed by the sharefarmer and his share of the proceeds of the joint enterprise. In same cases where he is responsible for management, as well as for supplying all labour required, his share may be as low as one-third, and in other instances as much as three-fifths.

Insecurity of tenure is a very serious disability to the sharefarmer inasmuch as it compels him to pursue a short-range policy in his management of the farm Most sharefarming agreements are terminable at one month's notice by either party, and under such circumstances the operator is hardly likely to conserve fodder or to implement a constructive programme.

The sharefarmer in the wheat industry is somewhat more favourably placed. His agreement covers the period necessary to prepare the ground and to grow and harvest the crop, and his share of the proceeds is generally reasonable.

The Landlord.

As the owners of agricultural land, landlords are primarily responsible for the exploitative methods followed by tenants and sharefarmers. By their failure to insist that tenants adopt a reasonable standard of husbandry, they are pursuing a short-sighted policy detrimental to their own interests, to the interests of tenants, and one which is reacting against the community.

The success of the landlord-tenant system in Great Britain, insofar as the conservation of soil resources is concerned, may be traced to the desire of landlords to retain their properties in an unimpaired condition for the benefit of their heirs. With this object in view, they restricted the activities of tenants and insisted on fertility conserving systems of farming. The motive was undoubtedly self-interest, but even this interest has not been sufficiently strong in New South Wales

In any scheme designed to improve the methods employed by tenants and sharefarmers, the support of landlords is indispensable, and landlords must realise that the ownership of land carries responsibilities to the community as well as to future generations.

It will be contended no doubt that land ownership confers the right to determine the use to which land is to be put and the manner in which it is to be handled. In this connection it is worthy of comment that in Europe the ownership of land involved certain obligations to the State until about the end of the 18th century. Then in France, England, Prussia, and other countries, the movement towards absolute property rights developed. This implied that the landowner was free from restrictions of any description as to his rights in regard to disposal and utilisation. Whilst beneficial in certain respects, this unrestricted tenure was so abused by many landowners that it again became necessary to emphasise the social function of property and of agricultural land in particular.

Of late years there has been a marked tendency to revert to the older conceptions regarding the responsibilities associated with the ownership of land, and modern legislation in many European countries has provided for some form of control over land utilisation. The most advanced legislation provides that every owner or user of agricultural land must make efficient use of it. War-time legislation in England is most drastic in this respect

In New South Wales, many landlords claim that tenants are often negligent, that they refuse to implement a constructive policy and are chiefly concerned with exploiting farms to their own advantage. No doubt this is true in some cases, and it is naturally proper that landlords should be able to evict negligent farmers. But in a great majority of cases the neglect by a tenant to make full and proper use of farm land and to maintain soil fertility is due to the absence of encouragement and reward from the landlord, as previously explained

A Soil Fertility Conserving Operation.
Distributing droppings in a grazing paddock.

The Tenant and Sharefarmer.

The tenant as a temporary occupant of agricultural land is always prone to follow an exploitative system of farming. His principal concern is not the effects of his methods on soil fertility, but the immediate financial returns. Should his tenancy be of short or uncertain duration, it is not to be expected that he will effect improvements to be enjoyed by his successors or by the landlord, unless compensation is provided, either by financial reward, or certainty of a reasonable tenure, or both.

Although tenant farming should be regulated as to specified minimum requirements necessary to safeguard soil fertility, the tenant should not

be prevented from exercising skill and enterprise in obtaining maximum production. This can be achieved by arrangements providing for the return to the soil of those elements removed in the production and sale of crops. The tenant can thus be permitted free scope for his talents without impoverishing the soil.

Whilst the tenant is accorded rather too much latitude in certain directions, the sharefarmer is often restricted in his operations by a conservative landlord upon whom he depends to supply a share of the fertilisers and seeds required.

Housing Conditions.

The social problems associated with farm tenancy are almost as important as those of a technical character. In the United States of America it is estimated that at least 34.2 per cent. of all tenant farmers move about each year, a similar percentage approaching the end of each tenancy year without reasonable assurance that they will remain on the farm another year. This undesirable state of affairs could easily develop in New South Wales. It can be avoided by the adoption of appropriate measures, including the cultivation of a changed social outlook.

To a considerable extent the stability of farm tenancy in Europe is due to the conception of farming as a way of life, as well as a means of securing a livelihood. In some sections of this State there is more than a tendency to regard farming as a means of livelihood only, the ambition of many being to retire to the cities and the larger country towns where living amenities are more attractive. Unsatisfactory farm housing conditions are in no small degree responsible for this attitude.

On numerous occasions departmental officers have directed attention to the deplorable living conditions provided for tenants and sharefarmers in certain districts. In many instances ordinary facilities for comfort, hygiene and sanitation are lacking, yet the farm operator and his family are compelled to work long hours, and in the dairying industry are dealing with a product demanding a high standard of personal cleanliness. The law demands that the dairy buildings conform to a certain standard to facilitate the production of milk under hygienic conditions, yet many dwellings lack bathrooms and laundries, and the water supply is often of the poorest description.

Apart from these aspects, poor housing induces the tenant to exploit the farm in an endeavour to transfer to better conditions at the earliest opportunity.

Farm Rents.

It has not been possible to study in detail the situation regarding farm rents, but from the evidence available rents appear to be excessive in some districts. Of special significance in this connection is the fact that the demand for farms exceeds the supply, and tenants and sharefarmers are therefore under the serious disability of renting farms on a competitive basis.

High rents, although attractive to the landlord, are detrimental in the long run. In combination with insecurity of tenure and lack of compensation for improvements, a high rent compels the tenant to follow a soil impoverishing form of agriculture in order to meet his commitments.

The rent of a farm is the annual amount paid for its use in cash or in produce. Factors determining rent are productivity of the soil, size and condition of the holding, proportion of arable to non-arable land, improvements, housing and social conditions, proximity to market, market value of the land, the demand for farms. In New South Wales, one of the principal factors determining rents appears to be the market value of the land in the district concerned. If close correlation existed between the market value and productivity of the land and current price levels for primary products, this method might be satisfactory, but unfortunately for the tenant the decline in price levels since the favourable period 1920-29 has not been accompanied by a proportionate decrease in the market value of land. Rents determined on the basis described are unfavourable to the tenant on a productive farm; on an exhausted farm in the same locality the position of the tenant is unenviable.

It is to the interests of both landlord and tenant that the tenant should not only be capable of paying his rent, but that he should be in a position to invest in essential farm improvements.

Some flexibility in regard to the amount of rent to be paid during periods of changing price levels is highly desirable. A steep depression in price levels following the making of a lease may result in the tenant being unable to meet his commitments. On the other hand, if the rent is fixed during a period of low price levels, some provision could be made for the landlord to share in the benefit of any subsequent rise of a substantial nature. Such adjustments can easily be made if accurate records of the farm business are maintained.

Improving Landlord-tenant Relationships.

No single activity can achieve the improvements necessary in landlord-tenant relationships. Legislation such as the Agricultural Holdings Act, 1941, can confer upon the tenant rights to compensation for improvements, for disturbance of tenure in certain circumstances, and for adopting a high standard of husbandry. It can provide some protection for the landlord against the actions of careless or unskilful tenants, but it cannot at once directly create a better atmosphere in landlord-tenant relationships nor can it compel the adoption of high standards of farming in the community.

In the course of time, however, tenants and landlords will become familiar with their privileges and obligations under the Act, and gradually a new system will be built up as landlords recognise that the new development is mutually beneficial. In certain instances it will be essential for the landlord to realise that a period devoted to constructive work is of greater importance than immediate maximum financial returns. In other words, he should not hesitate to make concessions calculated to build up the soil and the property generally.

(*To be continued.*)

Approved Seed—May, 1943.

To assist in the production and distribution of approved seed of recommended varieties of crops and vegetables, the Department publishes in this list each month the names and addresses of growers of such seed. For this service a charge of 2s. 6d. is made for each insertion of each variety listed. The number of varieties listed on behalf of each grower will be restricted to twenty-five for the time being. The Department may inspect the crop producing the seed, and in all cases a sample of the seed must be sent to the Department of Agriculture with information as to the location of its production, and must be accompanied by the fee indicated above.

If any seed producer does not wish to pay the advertising charge he may submit his name with the variety of seed and sample to the Department, and if it is approved his name will be listed in the Department and information will be supplied regarding it to inquirers.

Wheat—

Bencubbin.—Manager, Experiment Farm, Wagga. (5s. 6d. bushel, f.o.r.)
Bencubbin.—Manager, Experiment Farm, Cowra. (5s. 6d. bushel, f.o.r.)
Bencubbin.—Manager, Experiment Farm, Trangie (5s. 6d. bushel, f.o.r.)
Bordan.—Manager, Experiment Farm, Wagga. (5s. 6d. bushel, f.o.r.)
Bordan.—Manager, Experiment Farm, Cowra (5s. 6d. bushel, f.o.r.)
Dundee—Manager, Experiment Farm, Cowra (5s. 6d. bushel, f o.r.)
Eureka.—Manager, Experiment Farm, Temora (5s. 6d. bushel, f.o.r.)
Eureka.—Manager, Experiment Farm, Cowra (5s 6d. bushel, f o.r.)
Eureka —Manager, Experiment Farm, Trangie. (5s. 6d. bushel, f o.r.)
Eureka 2.—Manager, Experiment Farm, Trangie. (5s. 6d. bushel, f.o.r.)
Fedweb—Manager Experiment Farm, Wagga. (5s 6d. bushel, f.o.r.)
Ford.—Manager, Experiment Farm, Wagga. (5s. 6d. bushel, f o.r.)
Ford.—Manager, Experiment Farm, Cowra (5s. 6d. bushel, f.o.r.)
Ghurka.—Manager, Experiment Farm, Wagga. (5s. 6d. bushel, f.o r.)
Gular.—Manager, Experiment Farm, Temora (5s. 6d. bushel, f.o.r.)
Koala.—Manager, Experiment Farm, Temora. (5s. 6d. bushel, f o r.)
Ranee.—Manager, Experiment Farm, Wagga. (5s. 6d. bushel, f.o.r.)
Totadgin.—Manager, Experiment Farm, Trangie. (5s. 6d. bushel, f.o r.)

Wheat—(continued.)

Waratah.—Manager, Experiment Farm, Wagga. (5s. 6d. bushel, f.o.r.)
Waratah.—Manager, Experiment Farm, Trangie. (5s. 6d. bushel, f.o.r.)
Bungulla.—Manager, Experiment Farm, Temora. (5s. 6d. bushel, f.o.r.)
Bungulla.—Manager, Experiment Farm, Trangie (5s. 6d. bushel, f.o.r.)
Gluford —Manager, Experiment Farm, Cowra (5s. 6d. bushel, f.o.r.)

Oats—

Belar.—Manager, Experiment Farm, Cowra. (4s. 6d. bushel, f.o.r.)
Belar—Manager, Experiment Farm, Trangie. (4s. 6d. bushel, f.o.r.)
Buddah.—Manager, Experiment Farm, Trangie. (4s 6d bushel, f.o.r.)
Gidgee.—Manager, Experiment Farm, Temora. (4s. 6d. bushel, f.o.r.)
Gidgee —Manager, Experiment Farm, Trangie. (4s. 6d bushel, f.o.r.)
Guyra—Manager, Experiment Farm, Bathurst (4s 6d bushel, f o r.)
Kareela —Manager, Experiment Farm, Trangie. (4s. 6d bushel, f.o r.)
Lampton—Manager, Experiment Farm, Cowra. (4s. 6d bushel, f.o r.)
Mulga.—Manager, Experiment Farm, Temora. (4s. 6d bushel, f.o.r.)
Mulga.—Manager, Experiment Farm, Trangie. (4s. 6d. bushel, f.o.r.)
Weston —Manager, Experiment Farm, Cowra. (4s. 6d bushel, f.o.r)
Wongan.—Manager, Experiment Farm, Temora. (4s. 6d. bushel, f.o r.)

Barley—

Pryor—Manager, Experiment Farm, Wagga. (5s. bushel, f.o.r.)
Trabut —Manager, Experiment Farm, Wagga. (5s. bushel, f.o.r.)

Tomatoes—

Marvana — Rumseys Seeds Pty. Ltd., 331 Church-street, Parramatta
Australian Earliana—Rumseys Seeds Pty. Ltd., 331 Church-street, Parramatta.
Red Marhio No. 95—Rumseys Seeds Pty. Ltd 331 Church-street, Parramatta.
Vetemold—Rumseys Pty. Ltd, 331 Church-street, Parramatta.
Potentate—Rumseys Pty Ltd., 331 Church-street, Parramatta.

Cauliflower—

Shorts—H. Burton Bradley, Sherwood Farm, Moorland.

Varieties of Approved Seed Available.

In order that farmers may be directed to what are regarded by the Department as the most satisfactory local sources of approved seed of recommended commercial varieties of farm crops and vegetables, the Department is willing to supply information concerning such sources of seed of the following varieties:—

Wheat—

Bencubbin, Koala, Eureka 2.

Oats.—

Belar, Fulghum, Mulga.

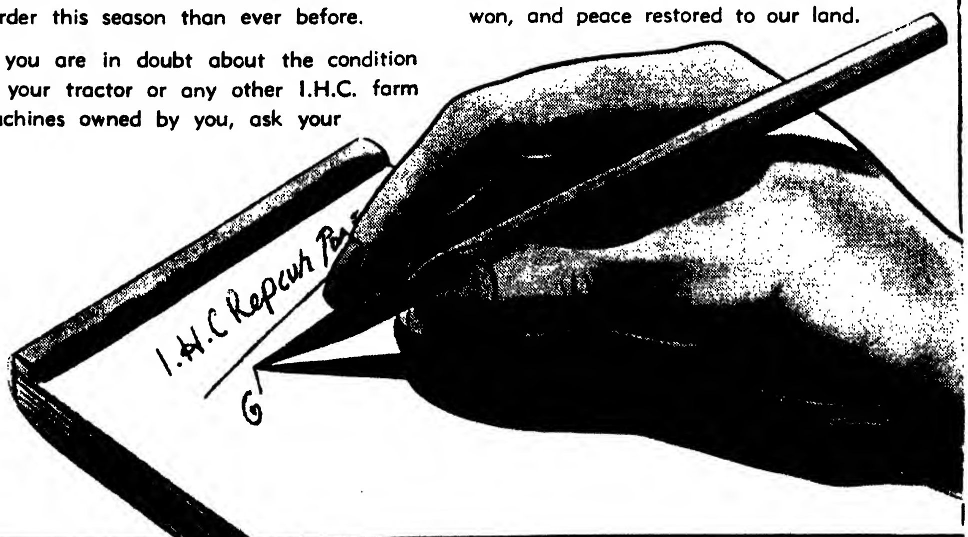
Grasses, etc.—

Phalaris tuberosa, Subterranean Clover (mid-season), Sheep's Burnet, Lucerne.

NOW is the time to REPAIR your FARM MACHINES

BECAUSE of the war-time shortage in the normal supply of new farm machines and the scarcity of farm labour, your present farming equipment is **precious** and vital to th. success of the National plan for the production of certain classes of food for our own and Allied soldiers, war workers and civilians. Therefore, every machine must be made ready to work harder this season than ever before.

If you are in doubt about the condition of your tractor or any other I.H.C. farm machines owned by you, ask your local International Harvester agent to help you check them over now and list the new parts you need. Remember, your local International Harvester agent can give you expert advice and service. Help him to help you keep your I.H.C. farming equipment in the best possible working order so that the Government's food production goals will be successfully realized, victory won, and peace restored to our land.



INTERNATIONAL HARVESTER COMPANY OF AUSTRALIA PTY. LTD.

5-11 PYRMONT BRIDGE RD., CAMPERDOWN, SYDNEY.

WORK AND SAVE — BUY WAR SAVINGS CERTIFICATES AND BONDS

The Quality of New South Wales F.A.Q. Wheat.

Season 1942-43.

J. R. FISHER, B.Sc.Agr., H.D.A., Analyst.

THE determination of the quality of New South Wales 1942-43 F.A.Q. wheat has shown that the grain is plump and well filled, but on the whole is softer and more starchy than 1941-42 F.A.Q. Total dockage is lower than for last season's wheat and fundamentally the gluten quality of both bulk and bag samples is similar to 1941-42.

The samples of wheat examined, representative of the grain delivered from the 1942-43 crop, were obtained for analysis by courtesy of the Sydney Chamber of Commerce.

The proportion of wheat from the three wheat-growing areas of the State, was as follows:—

	Bulk Wheat. Per cent.	Bagged Wheat. Per cent.
Wheat from northern areas ...	12	10
Wheat from western areas ...	36	40
Wheat from southern areas ...	52	50

General Character.

The grain was plump and well filled, but on the whole was softer and more starchy than the 1941-42 F.A.Q. wheat. In some districts, rust and weather damage were responsible for pinched and sprung grain, of low bushel weight, which would have undoubtedly lowered the general standard of both bulk and bagged F.A.Q. wheat, if it had been included in the general pool, but all under-quality wheat was isolated and stacked separately.

Dockage.

The amount of dockage as determined by means of a 2 m.m. slotted sieve is shown below:—

	Total dockage, including broken and pinched grain, wild and domestic oats, straw, weed seeds, dust, etc.	Broken and pinched grain.
	Per cent.	Per cent.
Bulk F.A.Q.	3·9	3·5
Bagged F.A.Q. ...	3·8	3·6

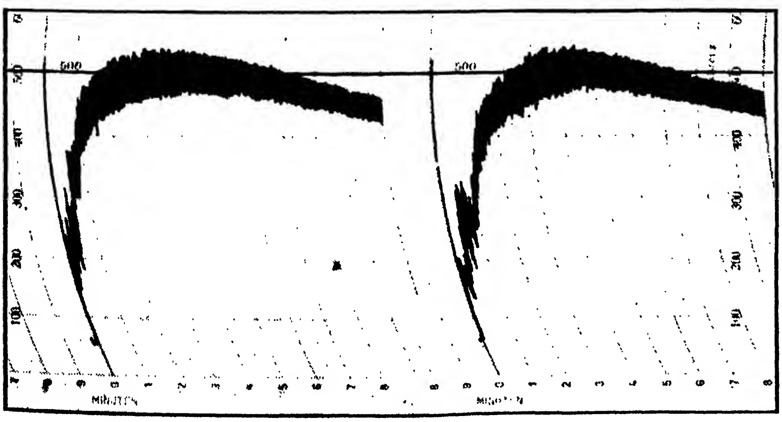
The total dockage on both bulk and bagged samples was lower than that for 1941-42 season's F.A.Q. wheat. This reduction in dockage can be attributed to the continued efforts made by the Manager of the Government Grain Elevators to reduce the amount of non-millable material in the F.A.Q., thereby raising the general value of F.A.Q. wheat for milling purposes, and at the same time utilising the available storage space for millable grain only.

In both bulk and bagged samples, the amount of actual rubbish was very small, by far the greater percentage of dockage consisting of broken and pinched grains. A certain proportion of this grain could be classed as millable wheat, and the remainder would have a definite value for feed purposes.

Milling Results and Analytical Data on the Wheat.

The figures set out in Tables 1 and 2 indicate that the general quality of the 1942-43 F.A.Q. is lower than that of the 1941-42 season's crop. Figures for protein content are 1.6 per cent. lower than those of the 1941-42 season for bulk F.A.Q. wheat, and the bagged F.A.Q. sample shows a decrease of 1.3 per cent. compared with 1941-42.

This decrease in protein content of the grain was to be expected, having regard to the high rainfall conditions experienced over most of the wheat-growing areas during 1942. Winter rains produced ample crop growth to ensure reasonably satisfactory yields, but the incidence of almost



Farinograms of 1942-43 F.A.Q. Wheat.

Left.—Bulk sample.
Right.—Bagged sample.

State-wide early summer rains resulted in heavy yields in most districts, with consequent lowering of the general quality of the grain.

Rust damage was experienced in some areas, and some grain was shot in the field, but all under-quality wheat was stacked separately and is not included in the F.A.Q.

Table 1.—Analyses of Grain.

Sample.	Declared bushel weight. Louis Schopper.	Bushel weight, clean wheat. Franklin.	Moisture content.	*Flour yield.	Milling quality.	Pelshenke time.	Nitrogen.	Protein (Nx 5·7).
	lb.	lb.	%	%		Mins.	%	%
Bulk F.A.Q.	63	62½	12·2	73·2	Excell.	44	1·83	10·43
Bagged F.A.Q. ...	63	62⅜	12·1	73·1	do	49	1·85	10·54

* Includes 2·5 of low grade flour which is not used in flour tests.

Table 2.—Analyses of Flour.

Sample.	*Nitrogen.	*Protein (Nx 5·7.)	Ash.	Gluten Content. Wet.	Gluten Content. Dry.	Gluten Quality.
Bulk F.A.Q....	1·60	9·12	0·41	31·2	9·7	Good.
Bagged F.A.Q.	1·64	9·35	0·42	31·6	10·0	Good.
Bulk F.A.Q. 1941–42 ...	1·88	10·72	0·44	36·2	11·6	Good to very good.

*Results expressed on 13·5 per cent. moisture basis.

Table 3.—Farinograph Data.

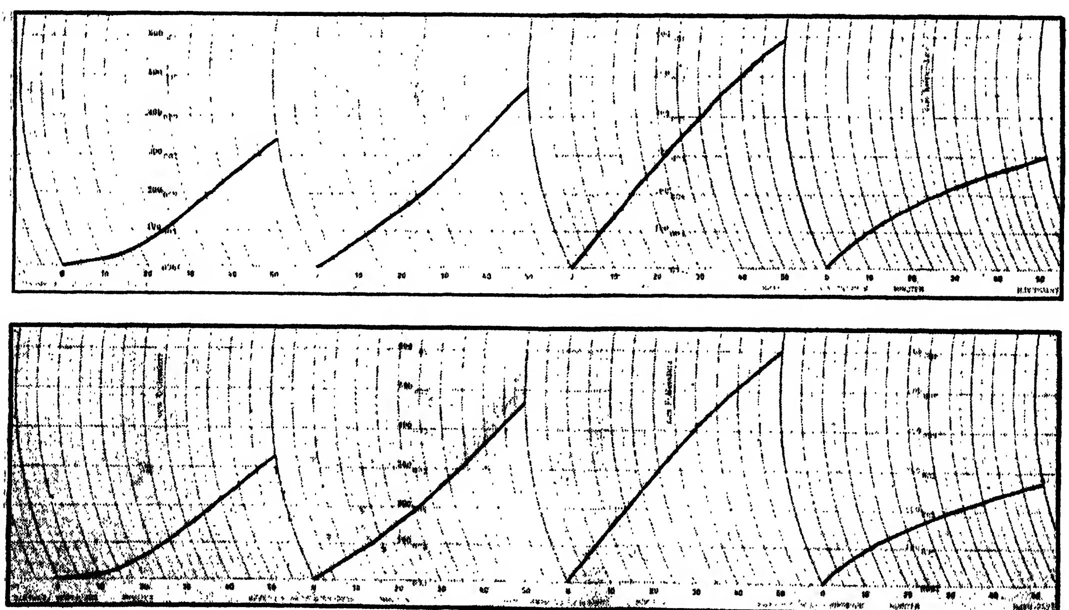
	1941-42 F.A.Q. Bulk.	1941-42 F.A.Q. Bagged.	1942–43 F.A.Q. Bulk.	1942–43 F.A.Q. Bagged.
Absorption	59·2% ...	58·5% ...	58·5% ...	58·8%.
Dough development time.	5 mins....	4½ mins.	4 mins....	4 mins.
Dough stability ...	2 mins....	1½ mins.	1½ mins.	1 min.
Dough weakening in Brabender units in 10 minutes.	35 units	40 units	50 units	50 units
Width of band at optimum consistency.	65 units	70 units	65 units	65 units.

Table 4.—Fermentograph Data.

	1941 42 F.A.Q. Bulk.	1941 42 F.A.Q. Bagged.	1942 43 F.A.Q. Bulk.	1942 43 F.A.Q. Bagged
	c.c.	c.c.	c.c.	c.c.
Gas produced in 1st hour ...	300	290	340	330
Gas produced in 2nd hour ...	500	470	470	470
Gas produced in 3rd hour ...	390	400	590	600
Gas produced in 4th hour ...	120	140	300	270
Total	1,310	1,300	1,700	1,670

Results of the Farinograph tests, which are set out in Table 3, give further evidence that the general quality of 1942-43 F.A.Q. wheat is lower than that of the 1941-42 harvest.

The Farinograph curves are of the same general type as those of 1941-42 F.A.Q. wheat, indicating that, fundamentally, gluten quality is similar to that of the past season's wheat, but the shorter dough development time and lower gluten



Fermentograph Charts of 1942-43 F.A.Q. Wheat.
Above:—Bulk Sample. *Below*:—Bagged Sample.

stability are evidence that fermentation tolerance of the 1942-43 F.A.Q. wheat is not as high as F.A.Q. wheat of the 1941-42 season.

Table 5.—Baking Results.

Sample.	Water Absorption.	Loaf Volume.	Symmetry. (Max. 10.)	Crust color. (Max. 10.)	Crumb texture. (Max. 10.)	Crumb color. (Max. 10.)	Handling Quality.
	Per cent.	c.c.					
Bulk F.A.Q. (M.P.).	54·0	510	8	8	9	8½	Fair to good.
Bulk F.A.Q. (M.P.B.).	55·0	585	8	8½	9	8½	do
Bagged F.A.Q. (M.P.).	54·0	545	8	8	9	8½	do
Bagged F.A.Q. (M.P.B.).	55·0	560	8	8½	9	8½	do

M.P. . Malt-phosphate procedure.
M.P.B. . . Malt-phosphate-bromate procedure.

Results of Fermentograph tests, set out in Table 4, show that both bulk and bagged F.A.Q. samples are superior in gas production to the 1941-42 F.A.Q. wheats. The increased gassing power of the 1942-43 wheat can be attributed to the late rains which were experienced over most of the wheat-growing areas during the ripening period of the crops.

The baking tests confirmed the chemical data, giving further evidence that the general quality of 1942-43 F.A.Q. wheat is lower than that of the past season. Nevertheless, loaf volumes were satisfactory, and the loaves were symmetrical in appearance with good crust colour and crumb texture, indicating that basically gluten quality is similar to that of 1941-42 F.A.Q. wheat.

Summary.

The general quality of the 1942-43 F.A.Q. wheat has been determined by milling tests, chemical analysis and Farinograph, Fermentograph and baking tests.

The tests have shown that fundamentally gluten quality of both bulk and bagged F.A.Q. samples is similar to that of the 1941-42 season's wheat, but gluten stability and protein content are lower. The protein content was 1.6 per cent. lower in the instance of bulk F.A.Q. wheat, and 1.3 per cent. lower in the instance of bagged F.A.Q. wheat, compared with the 1941-42 samples.

Fermentograph tests show that gassing power is higher than that of the past season's flour, and the baking tests confirm that a satisfactory loaf can be produced using straight run flour from F.A.Q. wheat.

Control of Rural Labour.

(*Continued from page* 202.)

What is the relationship of the National Service Officer to the War Agricultural Committee?

The War Agricultural Committee deals with many factors in rural production, one being manpower. The National Service Officer is a member of the Committee and he should treat the Committee as his consultant or advisory committee. The relationship should be good and clear on all matters of policy, and by attending meetings he can formulate plans from time to time.

In the matter of individual cases the National Service Officer must accept full responsibility for investigations, and whereas it is desired that he keep the Committee informed of his policy, he should carry out the detailed investigation for which he has the necessary powers. This is specially the case where claims are made for full release. In the case of seasonal leave, the National Service Officer generally has a working arrangement for expediting cases, and the Committees have often done much of the work.

The whole scheme in regard to manpower depends on a healthy relationship between the National Service Officer and the War Agricultural Committee. He is your man with the power, and he should keep you advised on policy and submit to Head Office any proposals that come from the Committee, of which he is a member himself.

What pools of agricultural labour are available?

(*a*) Skilled rural workers floating about to do sheep and wheat jobs. There is a huge pool of these workers, with a complete "blanket" over them.

(*b*) Seasonal workers, *e.g.*, chaff cutters, etc.—with a total exemption.

(*c*) Normal full-time rural employees.

(*d*) Week-end and holiday workers—unskilled but many very good, and a big pool, *e.g.*, we have a pool of 300 firemen on fruit harvesting.

(*e*) Women's Land Army—about 1,000—on a mobile basis, particularly for such work as fruit and potato harvesting. But we are aiming also to place them on individual farms to replace full-time permanent male labour, whilst simultaneously forming a further pool of 1,000 or more to replace the present mobile army.

(*f*) The Army—but difficult to use this.

(*g*) Prisoners of war. At present these are being used only on mass production of vegetables. No success as yet with an idea for use of P's.O.W. on a parole basis. Manpower Directorate may soon approach D.W.A.C's. re the possibility of a parole scheme.

(*h*) The farmers themselves—co-operative pooling. Manpower Directorate can also move farmers about from farms where not needed at the moment. to other farms. This will be, and has been, done in desperate cases.

British Agriculture.

Achievements in Response to War Needs.

Work of the War Agricultural Committees.

THE effect of the war on British agriculture and the transformation that had been achieved in order to meet the need for food and materials previously imported, were described in a broadcast to the nation by Hon. R. S. Hudson, M.P., British Minister of Agriculture.

The following extracts from the address are reprinted from the *Journal of the British Ministry of Agriculture.*

"AGRICULTURE in one form or another has been carried on in this country for at least four thousand years. I have had a hand in it for only two of them. But even so I thought it was time you heard from me what we have been doing, and what we hope to do with the 'national estate.' For that is what it comes to. Whatever the particular legal form of ownership or occupation, this is England, our countryside.

"Most of you know by now that it had been sadly neglected before the war. You can take it from me that the neglect was worse than anyone dreamed possible. Once fertile land that grew good crops and employed men, had become desolate. Farm buildings were in ruins; cottages tumbled down or occupied by week-enders from the towns. Even our grass, which should, with our climate, be best in the world, was often not producing more than half of what it ought—in many cases not a fifth, or even a tenth. Hedges had overgrown the land, stealing fertile soil and harbouring rabbits and rats to devour the crops. 'Land development'—what irony there is in that phrase!—had taken hundreds of thousands of acres of first-class farming land for houses and roads; lopping bits off farms and leaving them unworkable; encouraging speculation, so that some farmers did better by just sitting on their land and doing nothing, waiting for a bid that would bring them in more money than farming would ever have done. Of course, there were large areas of England that were still being farmed about as well as any land in the world. But much of our countryside was dying. Peace was desolating the land faster than war.

"We were not alone in this. Farmlands all over the world were dying. Our customers were being ruined. No wonder we had unemployment in our export industries. You cannot build prosperity at home on ruin of your customers abroad, and it is important for us to realise that the troubles of farmers were world-wide and that the post-war problem can only be tackled on a world-wide basis.

"With the war, the whole situation for British agriculture changed in a flash. We had to grow more food at home, not only to escape starvation, but to release ships to carry men and munitions of war. Pre-war, we were really producing less than two tons of food out of every five we were eating—for most of our cattle, our pigs and our poultry, like ourselves, were living on food from abroad.

"You have only to look round the country to see what a different landscape we have made of it. It has been done, too, with fewer skilled workers. We have to get crops grown on commons which had never been cultivated in the memory of man; on tens of thousands of small farms in the West, of

> EVERY *month that the war lasts shows a greater intensification of our national effort to win from the soil the maximum amount of food possible. In such circumstances an increased demand from farmers for information on the unusual and difficult problems with which they are faced, was to be expected. This has been reflected by a gratifying expansion in the circulation of the Ministry's Journal.*—Journal of the British Ministry of Agriculture.

awkward size and shape, and in our Midland grazing countries, where, after half-a-century, farmers had completely lost the art of the plough. In two-and-a-half years we have cut literally thousands of miles of hedges, cleaned out thousands of miles of ditches, drained in all some three million acres and opened up old tracks to get the machinery to the field. England looks much more cared for to-day. We have to thank machinery and countries like Canada, Australia and the United States, that have helped us with tractors and other implements. We have to thank the farmers and the farm workers, their sons and their daughters, but especially their long-suffering wives who play a much more important part in the business of agriculture than many people realise. We have to thank the Women's Land Army, and yet another great army—the army of volunteer helpers who have turned out at harvest time, including our own armed forces and those of the Dominions and our Allies.

"What of the result? The average yield of wheat in America is less than 15 bushels to the acre; our pre-war average was 33 bushels. This year the ordinary good British farmer is getting 40, a very large number are getting over 50, and some of our best farmers on our best land have reported yields of 80 or more bushels to the acre. But this also I would say to you, in humility and seriousness; much hard work and technical skill have played their parts in these mighty yields, amongst the richest of all time, but I believe we have a higher Power to thank as well, and from the depth of our hearts. Some Power wrought a miracle in English harvest fields this summer, for in this, our year of greatest need, the land gave us bread in greater abundance than we have ever known before. The prayer, 'Give us this day our daily bread,' has in these times a very direct meaning for us all.

"But it has not been, and it is not going to be easy. Let me tell you what Lord Cornwallis, Chairman of our Kent County War Committee, told us at the Farmers' Club this week. He said: 'The results achieved have not been obtained by just carrying out surveys or paying visits and issuing directions. Countless individual farmers have helped their neighbours, have changed all their farming practices, have voluntarily taken over derelict land and got on with the job themselves. Agricultural organisers, specialists, technical officers, advisory staff, have unceasingly spread the gospel of good husbandry and helped the weak and stepped-up the production of the strong. The work of the War Agricultural Committees has not been easy. It has not always been pleasant. It is not a pleasant task to go to your friends and neighbours whom you have known for years and tell them that if they cannot go the pace they must be turned out. But I think those of us who have to do these jobs are forgiven, because it is realised that we are trying to carry out a vital duty."

"To me, as Minister for Agriculture, one of the most heartening results is the effect all this has had upon the farming community as a whole. Here is an industry where there has been no absenteeism, and where the output per man has steadily risen. Agriculture, however, is lucky in this respect, for nearly all we have had to do with farming for war can be of permanent benefit when peace returns. It will not have to be scrapped and destroyed when the whistle blows for the armistice, for on that day we shall at any rate have our land and our people. We have in this favoured island the soil, the climate and the men needed to make British agriculture not only an efficient industry, but an inspiration to the world, as indeed it has been before in our history."

Stock Losses in Tung Oil Plantations.

STOCKOWNERS are warned of the danger of allowing stock to have access to paddocks in which tung oil trees are growing, particularly if the animals are short of feed. Experiment work at Glenfield Veterinary Research Station showed that sheep could be poisoned by the ingestion of the kernels, and an instance has now been reported in which losses occurred among cattle which were allowed access to a paddock containing a neglected tung oil plantation. The cattle were first noticed to be "tucked up" and very thirsty. They later became "dopey," scoured excessively, the faeces being thin and blood stained, and fell away in condition rapidly. Some of the cattle died or became so poor and weak that they were destroyed.—MAX HENRY, Chief, Division of Animal Industry.

The Cool Storage of Granny Smith Apples.

E. C. WHITTAKER, Fruit Packing Instructor.

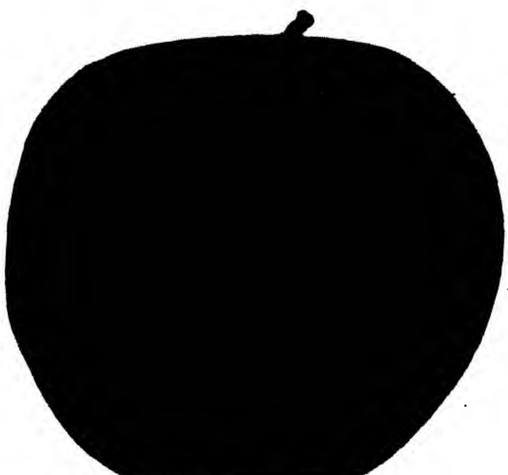
IN this State it has been the standard practice for years past to oil-wrap all Granny Smiths intended for cool storage for any length of time, and generally speaking the out-turn of this variety from New South Wales cool stores has been highly satisfactory so far as the incidence of superficial scald is concerned.

In view of the relative importance of the Granny Smith in New South Wales apple plantings, a serious position seems likely to develop during the coming season owing to a shortage of oiled wraps.

The time seems to have arrived when some improvised methods of scald prevention will have to be adopted—at least temporarily—and it is the intention here to give a brief résumé of the results attending work done during the past season or two by the Division of Horticulture, which had envisaged just such an eventuality.

In this State the Granny Smith is the only variety which can be said to give any great trouble so far as superficial scald is concerned.

Delicious, which in other States is referred to as susceptible to scald, gives no trouble here in this respect, provided it is picked at the correct stage of maturity. Thus, the oil-wrapping of Delicious can result in little save additional cost to the grower, apart from the fact that the delays incidental to wrapping prior to cool storing are not likely to benefit the fruit. Most growers realise that one of the main factors in the successful cool storage of Delicious is prompt storage as soon as possible after picking.



Granny Smith Apple Showing Superficial Scald.

Hence all available oil wraps should be conserved for the Granny Smith crop.

Oiled Wraps.

Many growers and also packing houses and other firms are holding limited stocks of these wraps and those in charge should see that

such stocks are used to the best advantage and not wasted on pears or non-scald susceptible varieties of apples which can be packed bare, if ordinary sulphite wraps are not available.

The next step is to spin the wraps out as far as possible and to that end it is suggested that only alternate layers in the cases of Granny Smiths be wrapped, commencing with the bottom layer and taking care that the top layer is also wrapped in the case of six row packs.

This will have the effect of cutting down requirements of wraps to little more than half, and in tests during the past two seasons has given practically as good results as wrapping right through. The layers not enclosed in oiled wraps can be packed bare.

Maturity.

Maturity is one of the most important factors in the keeping of any apple, and particularly Granny Smith intended for long storage. The more immature the Granny is when stored the more chance there is of severe scald developing, but, on the other hand, if the apples are over-mature when picked, there is a good chance that they will yellow up considerably in store—to the detriment of their sales value later on, as the trade nowadays demands a good green colour in Granny Smith.

However, owing to this demand for green-coloured Granny Smiths, there has been an increased tendency amongst some growers during the past few years to pick the apples more and more on the green or immature side; during the coming picking period with its improvised methods of scald control, picking at the correct stage is a matter which should receive close attention by every grower. Obviously it is of little use to retain a good green colour if the apples are going to show a high percentage of scald after removal from the cool store.

Of the two evils, viz., scald and yellow colour, the former is by far the more serious.

Packing Bare or in Plain Wraps.

It has been demonstrated by tests over several seasons that the Granny Smith will develop little or no scald for limited periods, if packed either bare or in ordinary plain sulphite wraps—provided it is reasonably mature when picked. Plain wraps exercise little or no control over scald, and hence so far as this trouble is concerned the fruit may just as well be packed bare.

In the case of highland-grown Granny Smith the period during which it is reasonably safe to cool store this type of fruit is limited to three or four months, and the apples should be removed from the store by the end of August at the very latest.

It is suggested, therefore, that all fruit not suitable for long storage, such as that from young and very lightly cropping trees, large over-grown fruit "D" grade, and even some "good" grade samples could be treated in this fashion and marketed early, thus leaving the oiled wraps for the better-class fruit capable of being held until late in the season.

Delayed Storage.

It has been the general practice in the past to hold Granny Smith in common storage for varying periods. This period of common storage varied from a week or two to as much as six weeks and longer. Of itself this common store period is of very limited value in scald control, unless carried to extremes, when such assets as colour and ultimate cool storage life are sacrificed. However, it has been demonstrated more than once in the past that a common store period of up to two weeks for highland-grown fruit does no harm, and is, in fact, a very definite advantage in conjunction with oiled wraps; in any case, apart from its effect on scald development, it is a very convenient period insofar as it allows of the crop being harvested without interruption and in addition allows a period during which pears and short storage apples can be packed out of the cool store to make room for the Granny Smiths. Furthermore, a short period of common storage such as this is of much value because it allows any troubles such as codling moth infestation, stem punctures, bruises, etc., to become more apparent and easily detected when packing, thus very often saving a good deal of extra labour and trouble in repacking later on.

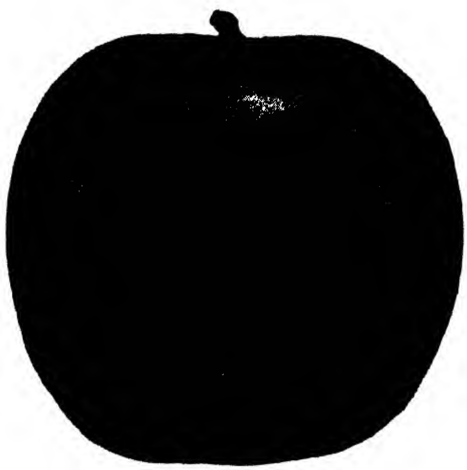
An excessive period of common storage is likely to curtail seriously the cool storage life of the apples, and in addition result in too much yellowing for present trade requirements, whilst the danger of losses from such physiological disorders as lenticel spot, etc., is increased after a certain time.

The Use of Oiled Sheets.

With a complete absence of oiled wraps as a possibility, steps were taken during the past season to try out the suitability of home-made oiled wraps and oiled sheets. We have to thank the Shell Co. for making available the type of oil suitable for this purpose, and Messrs. McFarlane and Burns for supplying the sheets of paper.

Of the home-made wraps little need be said at this juncture, except that they were entirely satisfactory and gave quite as good results as the commercial oiled wraps, but the difficulties of their treatment and of obtaining even ordinary good quality sulphite wraps, will probably preclude their general use in quantity.

The oiled sheets, however, as a wartime economy measure and as a practical means of getting around the shortage of oiled wraps, have a lot to recommend them.



Normal Granny Smith Apple.

The whole idea of using oiled wraps for scald control is based on the idea of having sufficient oil distributed evenly throughout the case to absorb and neutralise the volatile gases given off by the fruit during storage. The wrapper itself is merely a convenient carrier for the oil and in the case of most commercial oiled wraps, contains approximately from 13-14 per cent. of a special type of odourless and tasteless oil.

The underlying idea, therefore, in regard to the oiled sheets was to supply approximately the amount of oil required throughout the case, but in a simpler manner than heretofore. This was accomplished by using large sheets of heavy paper, cut to the inside dimensions of the standard bushel case, *i.e.*, 18 inches x 11½ inches, and impregnating them with the special oil previously mentioned.

In practice a single sheet of this oil-impregnated paper was placed on the bottom of the case and other sheets between each two layers of fruit, which incidentally can be packed bare. A sheet over the top layer of fruit completes the operation, thus giving a total of seven sheets to a six-layer pack, and six sheets to a five-layer.

When treated in this way it has proved possible to keep Granny Smith apples in excellent condition until early December, and for all practical purposes the control of scald was as efficient as by the use of commercial oiled wraps throughout the case. Upon removal from the cool store, if the fruit is repacked the oiled sheets should be retained in position.

One slight disadvantage of the oiled-sheet method is the increased tendency of the fruit, if packed bare, to bruise slightly, and it is perhaps relevant here to point out that if packing any apples and pears bare, no attempt should be made to attain the same degree of "bulge" as is usual with wrapped fruit—the pack is relatively solid and no allowance can be made for paper padding.

Against this slight disadvantage of the oiled sheets, however, can be placed the advantages of cheapness and easier and quicker packing and repacking after cool storage.

Recommendations in Summary.

In conclusion, therefore, the following recommendations are made:—

1. Pick the fruit at the correct degree of maturity, and allow no more than two weeks common storage.

2. If limited stocks of oiled wraps are available, use them only for the better class fruit and spin them out by wrapping only alternate layers.

3. Pack fruit unsuitable for long storage either bare or in plain wraps and market before the end of August at the latest.

4. If no oiled wraps are available, or not in sufficient supply, use the home-made oiled sheets.

5. As these are at best only improvised methods of scald control—devised to meet the present shortage of wraps—do not attempt to hold Granny Smith apples so treated longer than the November-early December period at the latest.

Common Storage of Apples.

E. C. WHITTAKER, Fruit Packing Instructor

SO many factors outside human control must be taken into consideration in connection with common storage of apples that it is difficult to see how anything very definite in the way of general recommendations can possibly be made. These factors include, age and vigour of trees, climatic conditions, size of crop, class of soil, weather conditions during the growing season and particularly just prior to picking, and temperature after picking and during storage.

In addition, such controllable factors as soil management, pruning, thinning and type of storage facilities available all have a bearing on the ultimate storage life of the fruit, whilst the matter of picking at the correct stage of maturity is of vital importance. Thus, unless the previous history of the fruit is known, it is difficult to make recommendations.

From the information gathered during past years it is possible, of course, to say that such and such a variety will hold better up to a certain time than some other variety in common store under equal conditions, but to attempt to treat the subject in a general way, more or less applicable to the whole State could lead to very confusing results. The storage qualities of fruit may very easily vary from farm to farm—even within a particular district—depending on many of the factors enumerated above.

Furthermore, the question "Just when has an apple reached the end of its useful common storage life," must be decided. Obviously the apple should still be of good eating quality and capable of retaining its condition for a further week or two to allow for the delays incidental to handling and marketing prior to it reaching its ultimate destination, *i.e.*, the consumer. This is a matter often overlooked both in common and cold storage. Many apple varieties will often retain a first-class outward appearance long after the eating qualities have deteriorated to a very marked degree, and this is a matter which should always be kept in mind when storing.

Taking the foregoing qualifications into consideration, the following periods are suggested as a guide for common storage of highland-grown apples allowing for normal conditions of weather, cultivation, etc.

Granny Smith.—Two to three months. The limiting factor with Granny Smith is the natural tendency to change to a yellow colour which is not favoured by the trade. Lenticel and Jonathan spot are also likely to be troublesome after six to seven weeks, particularly in large fruit. Fruit from young and lightly cropped trees should not be held for more than four or five weeks.

Delicious.—Four to five weeks. Not a good common store variety. It will often retain a fairly good appearance up to ten to twelve weeks, but the flesh loses its character and becomes mealy long before this. Too valuable a variety to risk spoiling by faulty handling.

Jonathan.—Four to five weeks. Not a good common storage variety even under the best of conditions. Liable to wither badly if picked too early and to break down quickly if a little too mature. The size of the fruit also has an important bearing on keeping qualities with the Jonathan—probably more so than with most varieties. The period given, viz., four to five weeks, would apply mainly to the smaller sizes in the commercial size range, say 2⅝-2¼ inches. For larger sizes, say 2⅞-2¾ inches, the period of reasonably safe common storage would be probably no more than two to three weeks.

Democrat.—Three to four months. Probably the best variety for common storage if fruit is not large.

Stayman.—Three to four weeks. Not a good common store variety—softens quickly.

Yates.—Three to four months. It is a good keeper although inclined to go leathery if common stored for longish periods.

McIntosh Red and Fameuse.—Two to three weeks. Both keep well for soft varieties, but are inclined to become too soft and lose flavour as storage period extends.

Gravenstein.—Three to four weeks. Keeps well for an early variety.

The size factor plays an important part in the keeping qualities of these last three varieties—as, in fact, it does particularly with all soft varieties. In general, it will be found that with McIntosh Red and Gravenstein, sizes 2¾ inches and smaller, and Fameuse, 2½ inches and smaller, will usually prove to be the best keeping sizes.

Preparing the Soil and Planting Fruit Trees.

UNLESS the subsoil is very friable, land that is to be used for an orchard should be ploughed and subsoiled before the trees are planted. The subsoil will, of course, sooner or later settle down to its original state; but even if it is only for the first season, the trees have the benefit, their roots being given a better chance of becoming well established. Another advantage of subsoiling is that it finds roots that have been missed when the land was grubbed. This is of special advantage in country infected with Armillaria.

A practice sometimes advocated is to subsoil only a strip along the line of trees, and each following winter to widen this by a few furrows until the whole area has been subsoiled, the argument being that in this way the roots, as they spread, met a newly subsoiled area. The drawbacks to this practice are the risk of damage to the young trees by working the large team necessary for the subsoiler, and the likelihood of the job never being completed.

It is best to carry out subsoiling some months before planting, and leave the land in a rough state; it then has a chance of absorbing any rains that may fall, and planting can be carried out just when desired. Fifteen inches is a good depth to aim at when subsoiling, but in most land there are places where the subsoiler will rise to 12 inches, bogging in to over 18 inches in other places. Just before planting, the land should be deeply ploughed, followed by a deep cultivation that will bring any clods to the top. Although the harrow is not considered a desirable orchard implement to use after planting, a harrowing before planting facilitates laying out operations.

Methods of Planting.

On very slight slopes or levels where there is no fear of washaways, the orchard can be laid out on a regular system of straight lines. Some orchardists prefer the square and others the hexagonal or equilateral triangle method. With the latter system the trees are more evenly spaced. Where orchards are being planted on areas or soils likely to erode, the contour method of planting is recommended.

The greater portion of the pome fruits produced in New South Wales is grown on the tablelands or slopes, and unfortunately, as a result of the intensive cultivation required in order to keep the trees healthy and bearing annual crops of quality fruit, the soil erosion problem is one in which the majority of the pome fruit growers are intensely interested.

In the planting of new orchard areas the mistake is frequently made of concluding that because the area in question has not shown signs of washing in the past it will not do so in the future. Areas which have previously been under pastures, and even ground which has been cropped with cereals, etc., for many years and has shown no signs of washing may, when planted with fruit trees and continually cultivated, quickly show small washes, especially in cut-outs made by the ploughs, wheel tracks, etc. These miniature washes, which at first are hardly noticeable, will increase in depth and width unless they are attended to, until, as is to be found in many of our older hillside orchards, they quickly develop into gullies and creeks, and are a constant menace. The orchard gradually becomes washed out and valueless when, in reality, it should be in its prime.

No system of contour banking on old orchards, or contour planting of young orchards, will prevent soil erosion altogether. All hillside orchards must wash to a more or less extent; but by a proper laying out of orchards or vineyards on the contour system all serious soil erosion can definitely be eliminated, and the gradual sheet erosion, which must necessarily take place, be reduced to a minimum.

PLANT DISEASES

Notes contributed by the Biological Branch

Division of Science Services

Rotting of Carrot and Beet Seed Roots.

PARTIAL failure of several transplanted carrot and beet seed crops occurred last season owing to rotting and collapse of the main storage roots. After selection for colour and shape the roots were transplanted as soon as possible and appeared to make an excellent start. Many plants produced an apparently normal seed-stalk and some flowered well. Thereafter, further development ceased and the seed-stalks commenced to wither and fall over.

Examination of the seed-roots showed that they were badly shrunken, and had developed only a meagre root system after transplanting. Some seed-roots had shrunken so badly that there was a space between them and the sides of the hole they originally occupied. In irrigated crops water collected in this cavity and assisted in the destruction. A number of different soil-dwelling fungi and bacteria, not normally parasitic, were associated with the shrunken and rotted parts of the seed-roots, but none was regarded as of primary importance.

It is thought that the cause of the trouble has been elucidated, and the Biological Branch is indebted to Mr. W. R. Watkins, Manager, Leeton Experiment Farm, for throwing light on the problem.

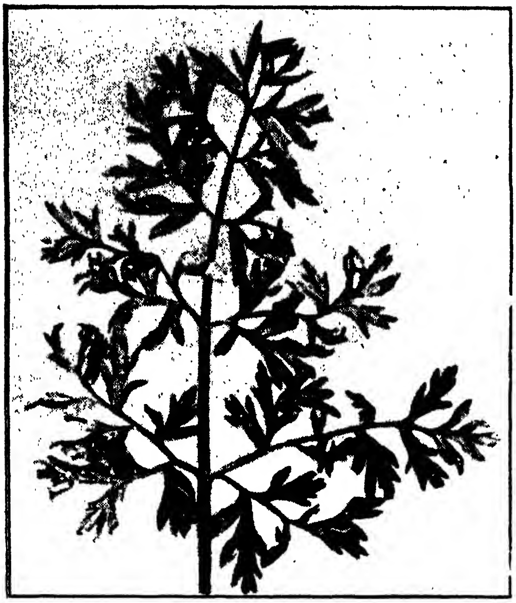
There is now good reason to believe that it was the selection of over-mature roots of high sugar content, as seed-roots, that was mainly responsible for the loss. Very limited experience had been obtained previously with carrot and beet seed growing in New South Wales to serve as a background for last year's operations, and it was natural that growers should err on the side of selecting plump and mature roots. The instruction that was available to them stressed the importance of conformity of roots and tops to varietal type, rather than the more important selection and transplanting of roots, as early as it is possible to select them, for colour, shape and habit of growth. This can be done when roots are one-half or three-quarters grown.

It is now realised that young seed-roots of carrot and beet have the ability to callous over readily any mechanical injury received at transplanting, whereas older roots of higher sugar content may fail in this regard; and more important still, young seed-roots have the vigour to re-establish themselves in their new position, with an extensive root system, and increase in size before running to seed. It is unnecessary, of course, to point out that more loss from rotting of sets is likely to occur on old vegetable land than on new ground, irrespective of the above considerations.

Bacterial Blight of Carrots.

THIS disease has been noted twice during the past three months—once attacking a seed crop. It has probably been recently

introduced with seed from overseas. The symptoms on the leaves are irregular, dark-brown spots on the leaf segments, sometimes with a lighter halo, and short brown streaks on the leaf stalks. Under conditions which favour the disease, such as periods of high humidity, the older leaves may be killed, and dry up.



Carrot Leaf Showing Severe Blighting of Segments.
[After Kendrick.

Mild leaf infection cannot easily be distinguished in the field from the leaf spots due to the parasitic fungi *Macrosporium* sp. and *Cercospora* sp.

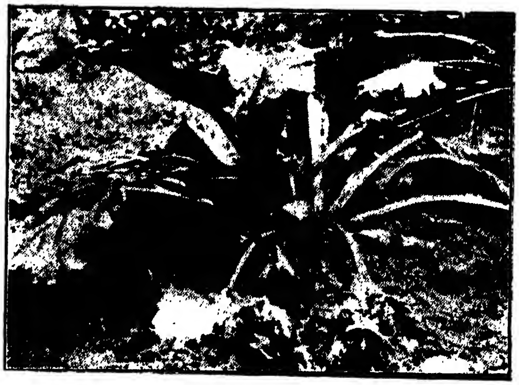
Severe leaf spotting may reduce the yield, but light infection does not appear to reduce it materially. The damage to seed crops is likely to be a more serious cause of loss. The flower heads are blighted either partially or completely as they develop. In U.S.A. it has been found that a severe attack at an early stage of flowering may weaken the plant so that no seed can be formed, but usually new branches develop from below and a partial seed crop is produced on the lateral shoots. The likelihood of such seed being infected is obviously high.

Roots for seed production should be selected from a clean crop, and land which has borne an infected crop should not be used for carrots in the following year.

Rhubarb Wilt or Crown Rot.

THIS disease is newly recorded for New South Wales, but it appears to be so widespread that it is likely to have been present for some years. It is caused by a soil-inhabiting, parasitic fungus, *Phytophthora parasitica,* which under suitable conditions attacks and rots the crown and leaf bases.

Affected plants wilt rather suddenly and quicky die out. On digging up such a plant it will be found that the crown and leaf bases are affected with a brown rot, and a cottony growth of fungous threads may be present between the affected leaf bases. In the early stages the roots are unaffected, but as the disease spreads they become rotted also, from the crown. The disease requires hot, wet conditions for its development; it is most prevalent in heavy soil and is to be observed first in any depression in the field where water may lie.

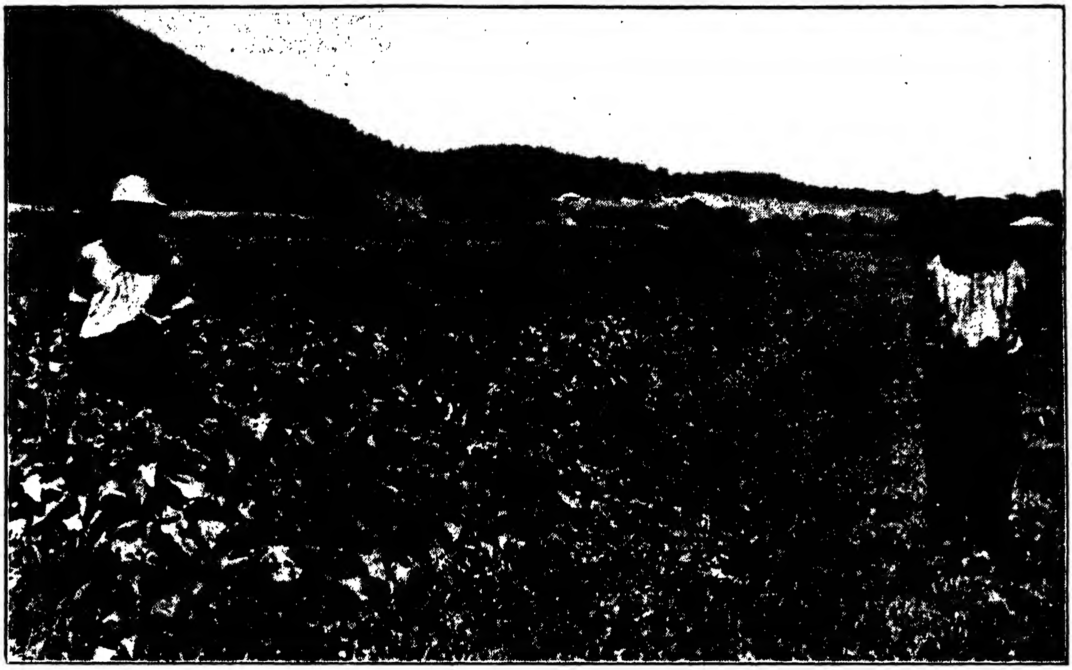


Rhubarb Plant Wilting, following the Rotting of the Crown and Leaf Bases by *Phytophthora parasitica.*
[After Godfrey.

To avoid losses, rhubarb beds should be well drained and not over-watered. If the disease makes its appearance, a crop rotation should be adopted so that rhubarb is not again grown for several years in the affected bed.

Shot-hole Scab of Stone Fruit Trees.

"SHOT-HOLE" of the foliage of stone fruit trees may result from one or other of several different causes. These may be parasitic or non-parasitic in character, and amongst the former are included several different fungi and also certain bacterial organisms.



[*Photo by Dr. Lilian Fraser.*

Fixation of Nitrogen from the Air by Leguminous Crops.

Paddock at Mr. D. Cameron's Farm, Mount George, showing growth of vegetation following, on the left, a crop of peas, the roots of which developed legume nodules; and, on the right, a crop of lupins which did not develop nodules. In neither case was artificial inoculation of the seed carried out, but it happened that the soil in this paddock contained legume bacteria suitable for peas, but did not contain the strain of bacteria suitable for lupins. Good crops of both peas and lupins were obtained and were later ploughed in for green manure.

With the aid of the nodule bacteria, the peas, on ploughing in, added nitrogen to the soil, as is indicated in the illustration; the lupins, however, being without nodules, merely absorbed nitrogen from the soil for their growth and when ploughed in, only returned the nitrogen again to the soil. (Some nitrogen is actually lost in this turning-over process.)

The moral, of course, is—unless you are certain the legume crop you intend sowing will find the right strain of bacteria in the soil, inoculate the seed before sowing. (See *Agricultural Gazette*, January, 1943, for details.)

Clasterosporium carpophilum is prominent amongst the fungi capable of causing shot-hole in the foliage. It is also the cause of twig blight and of the severe fruit scab which occurs from time to time on various stone fruits, particularly apricots and certain varieties of almonds. It is only in certain seasons that shot-hole scab on apricots is severe or general, and under these conditions it is usual to find little or no evidence of the foliage symptoms. On many almond varieties, however, shot-hole scab occurs consistently.

The most characteristic feature of fruit infection is the raised brownish scab which ultimately tends to flake off, leaving a discoloured mark on the skin. A discoloured depression may or may not be evident late in the season, depending on the amount of size-increase in healthy tissue surrounding the affected area, or the entry of secondary organisms. Scab on almonds is frequently accompanied by an abundant exudation of gum.

Control Measures.

Satisfactory control may be obtained by applying Bordeaux mixture (6-4-40) plus an efficient spreader at the following periods:—

(*a*) In the autumn when the leaves are falling.

(*b*) In early spring when a trace of petal colour is apparent i the swollen blossom buds.

High spray pressure and good cover of spray on all parts of the tree are essential for success in controlling the disease.

Satisfactory improvement may not always be apparent in the first season, partly because of the high percentage of old twig infections established in the tree and partly because of deficiences in the spray coverage. If pruning out infected twigs as a supplementary measure is not considered a profitable expenditure of labour, then the best that can be done is to apply Bordeaux mixture annually. This will gradually eliminate the fungus parasite.

Cherry Leaf Showing Development of Shot-hole.

New Plant Diseases.

DURING the three months ending March, 1943, the following plant diseases have been recorded for the first time in New South Wales:—

Ajuga metallica, ajuga. *Ramularia ajugae* (Niess.) Sacc. (Leafspot); Oberon.

Amygdalus persica; peach. *Oidium* sp. (powdery mildew); Metropolitan.

Begonia semperflorens, bedding begonia. *Pythium splendens* Braun (Crown rot); Metropolitan.

Begonia sutherlandi, begonia. *Oidium* sp. (powdery mildew); Metropolitan.

Capsicum annuum, pepper. *Oidiopsis taurica* (Lev.), Sacc.; Metropolitan.

Cestrum parqui, cestrum. *Oidium* sp. (powdery mildew); Metropolitan.

Cochlearia armoracia, horseradish. *Alternaria herculea* (Ell. & Mort.), Elliot (leaf spot); Oberon.

Cymbidium spp., Mosaic (virus); Metropolitan.

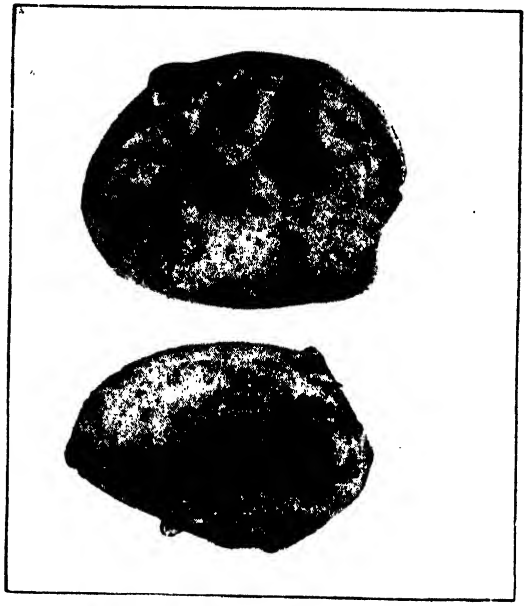
Daphne odora, daphne. *Rhizoctonia solani*, Kuehn (collar rot); Metropolitan. *Sclerotinia sclerotiorum* (Lib.), Mass. (branch blight); Metropolitan.

Datura tatula, thorn apple. *Macrosporium* sp. (leaf spot); Cornwallis.

Daucus carota, carrot. *Pseudomonas carotae*, Kendrick (bacterial blight); Wellington, Metropolitan.

Dendrobium speciosum, Rocklily. *Phoma citricarpa* McAlp. (leaf spot); Metropolitan.

Dendrobium sp. Mosaic (virus); Metropolitan.



Shot-hole Scab of Almond, Caused by *Clasterosporium carpophilum.*

Note exudation of gum

Eschscholtzia californica, Californian poppy. *Corticium rolfsii* (Sacc.), Curzi (root rot); Metropolitan.

Heliotropium europeum, wild heliotrope. *Cercospora taurica*, Tranzsh (leaf spot); Wellington.

Hyparrhenia filipendula. *Claviceps* sp. (Sphacelia stage) (Ergot); Ben Boyd.

Lactuca scariola, prickly lettuce. *Erysiphe cichoraccarum*, D.C. (powdery mildew); Metropolitan.

Lathyrus latifolius, perennial sweet pea. *Colletotrichum pisi*, Pat. (anthracnose); Oberon.

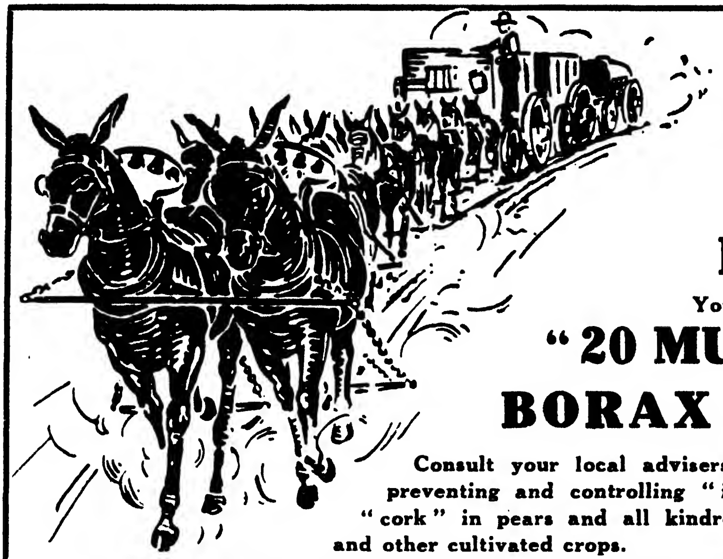
Lycopersicum esculentum, tomato. *Rhizoctonia solani*, Kuehn (fruit rot); Mt. George.

Maurandia barcleaiana, maurandia. *Corticium rolfsii* (Sacc.), Curzi. (root rot); Metropolitan.

Primula polyantha, polyantha. *Ramularia primulae* (D.C.), Duby (leaf spot); Oberon.

Rheum rhaponticum, rhubarb. *Phytophthora parasitica*, Dast. (crown rot); Richmond, Dubbo, Metropolitan.

Zinnia sp., zinnia. *Sclerotinia sclerotiorum* (Lib.), Mass. (blight); Metropolitan.



INSECT PESTS.

Notes contributed by the Entomological branch.

The Angoumois Grain Moth.

(*Sitotroga cerealella.*)

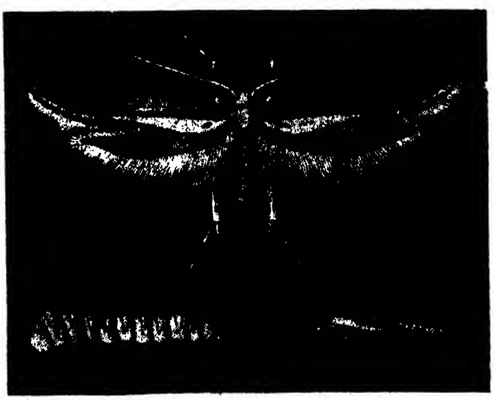
THE Angoumois grain moth is a cosmopolitan insect, the caterpillars of which feed upon seeds of the cereal type, amongst which are included wheat, oats, corn, barley, sorghum, etc. The ears may be attacked in the field, but usually most damage occurs during storage, when generation after generation of moths may develop.

The eggs, which measure about 1/40th inch in length, are white when first deposited, but become reddish before the caterpillar or larva emerges. They are laid either singly or in batches, upon or near their food, and as many as 150 to 300 eggs may be laid by an individual female. Upon hatching, the minute white larva bores into a grain and commences to feed upon the contents.

In the early stages of infestation the injury is difficult to detect, as the hole made by the larva in boring into the seed is extremely small. When fully-fed, the larva eats out a tunnel to the outside of the seed, but leaves a thin layer of the seed coat intact. It then changes into a chrysalis or pupa within the tunnel, and later emerges as an adult moth which pushes aside the thin section of seed-coat that covers the exit to the tunnel.

The moths, which measure about ½ inch across their outspread wings, vary in colour from yellowish brown to buff, and closely resemble the common clothes moth, and when such moths are seen flying about grain it may be suspected of being infested with the Angoumois grain moth.

The life cycle from egg to adult may be as short as five weeks during the warm weather, and numbers of generations occur during the year.



Adult, Larva and Pupa of the Angoumois Grain Moth.

In addition to the damage the moth larvae cause to the cereals, these soft-bodied caterpillars are also the normal hosts of the microscopic mite, *Pediculoides ventricosus**, popularly known as the hay or straw itch mite, which has been very prevalent during the past few months. Where the population of grain moths is allowed to increase and the infestation becomes severe, the itch mite infestation will also tend to become more severe.

Preventive Measures.

Prompt harvesting of a crop, and threshing and storing under conditions unfavourable to moth attack are the best methods of preventing damage.

Bulk storage in silos is the most satisfactory method of keeping grain on the farm, and should be adopted wherever practicable. Concrete, wooden or reinforced galvanised iron silos may be used for this purpose. Where silos are not available the grain should be stored in bags in stacks or in sheds or barns, and every care should be taken to ensure that the work is

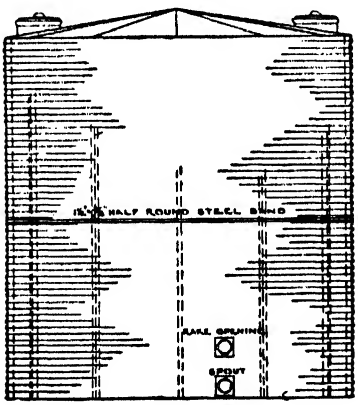
* An account of this mite was given in the *Agricultural Gazette*, January, 1943, p. 41.

carried out in such a way as to minimise insect attack and to make the treatment of the grain possible, should this become necessary.

Whichever method is used, all waste grain left lying about from the previous season should be swept up and destroyed; the walls of sheds or barns should also be swept and as an additional precaution to kill any insects sheltering on the walls, the latter may be sprayed with a strong kerosene emulsion containing 3 per cent. of cresylic acid.

A Cob Showing Moth Emergence Holes in the Grains.

Where the moisture content of the grain can be reduced to 13 per cent. or below, the amount of damage caused by the moth will be greatly reduced.



ELEVATION
A Galvanised Iron Grain Silo.

Remedial Measures.

Should the grain have become infested, it will be necessary either to fumigate it or to use a heat treatment to check further damage. Where grain can be heated to 120 or 125 degrees Fahr. for several hours, all insects in it will be killed, without injuring its germination.

Grain stored in silos or well-constructed sheds can be fumigated readily, but bags in stacks are difficult to fumigate unless covered with malthoid or other material. Small numbers of bags can be fumigated by enclosing them in heavy tarpaulins which should be carefully tucked in under the bottom bags.

Carbon bisulphide and hydrocyanic acid gas are the fumigants most commonly used, and of these carbon bisulphide is to be preferred, although it has the disadvantage of being highly inflammable and explosive, and naked lights or fires of any kind must be kept away from the gas during operations. Fumigation with hydrocyanic acid gas should only be carried out by an experienced operator, as hydrocyanic acid gas is one of the most poisonous gases known.

When fumigating a silo or shed that has been made reasonably gas-tight, carbon bisulphide should be used at the rate of 5 lb. (3 pints) to each 1,000 cubic feet of air space. A silo or shed that holds 1,000 bushels of grain when full, would have an air space of approximately 1,300 cubic feet.

Where carbon bisulphide is used under other than reasonably gas-tight conditions,

Grain Showing Circular Patches of Skin Left by the Moth Larvae.

up to as much as four times the above quantity of carbon bisulphide may have to be used.

The carbon bisulphide is poured on to some sacks placed on top of the grain and then the opening or door carefully sealed. The gas given off, which is heavier than air, should be allowed to act for 24 hours or longer, except where the grain is required for seed, when the 24 hours should not be exceeded. After fumigation the grain should be thoroughly aired.

WARNING.—No light of any description (pipes, cigarettes, fires or embers, radiators, stoves, etc.) must be allowed in or near sheds or buildings during the process of fumigation with carbon bisulphide. The precaution should also be taken of cutting off the electric current. Even hot steam pipes have been known to cause explosion of this gas, and the steam should be cut off and the pipes allowed to cool before proceeding with fumigation.

In lieu of carbon bisulphide, mixtures of ethylene dichloride and carbon tetrachloride (3 parts to 1 part by volume), and non-inflammable mixtures of carbon bisulphide are sometimes used, but their non-inflammability is their only advantage.

The Vegetable Weevil.

(Listroderes obliquus.)

VEGETABLE growers are warned that the larvae or grubs of the vegetable weevil have already begun to make their appearance amongst crops and weeds. A close watch should be kept, and control measures undertaken before serious damage has been caused.

The small stout-bodied grubs generally make their appearance about three to four weeks after the first autumn rains. They are legless, and measure about ½ inch in length when fully-fed, and vary in colour from light-green to yellow. The grubs are to be found on the undersurface of the leaves or on the crowns of the plants and large irregular holes may be eaten in the leaves or the new leaf growth of the crowns may be eaten away as it develops. The larvae become fully-fed in from four to six weeks, and they then enter the soil, where they construct cells within which they enter their pupal or chrysalis stage. The grey-brown adults commence to emerge from the soil about the end of August. The larvae feed mainly at night but may also feed during the day.

Control.

Clean cultivation is an important factor in the control of this pest, and all weeds should be destroyed early in the winter. Weed destruction late in the season may cause a migration of these or other pests into cultivated areas.

As an additional precaution, ground that has been cleared should be baited after an interval of several days either with poisoned foliage or poisoned bran mash. This procedure is particularly important when any ground is known to have been infested or there is suspicion that it is infested.

With most crops, such as carrots, potatoes, etc., *the foliage of which is not used as food,* control may be obtained by spraying or dusting with lead arsenate.

The Spray.

Lead arsenate powder, 4 oz.
Water, 5 gallons.

The Dust.

Lead arsenate powder, 1 lb.
Kaolin or hydrated lime, 4 lb.

Where the larvae are infesting crops such as lettuce, etc., *which must not be contaminated with lead arsenate,* a poisoned bran mash or poisoned foliage bait must be used.

The formula for the poisoned bran mash is as follows:—

Bran	24 lb.
Salt	8 oz.
Sodium arsenite ..	8 oz.
or Paris green ..	1 lb.
Water	2½ gals.

Larva or Grub of the Vegetable Weevil.

The sodium arsenite should be dissolved in the water, the salt then added and the mash prepared. If Paris green is used, it is mixed dry with the bran and the mash then prepared with the water in which the salt has been dissolved. The bait should be broadcast and partly worked into the soil in the late afternoon. It must be remembered that the bait is poisonous and should be kept out of the reach of stock and care should be taken in handling it.

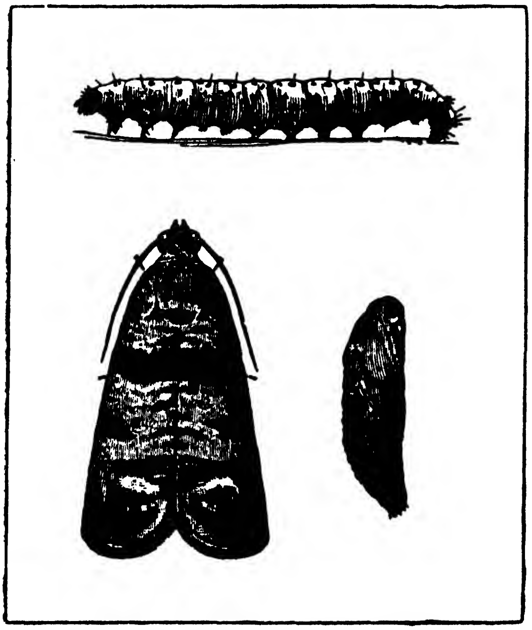
For baiting, chopped leaves of Cape weed, marsh mallow or waste lettuce or turnip leaves, etc., which have been either sprayed or dusted with arsenate of lead, should be scattered over the ground late in the afternoon.

The Codling Moth.

(Cydia pomonella.)

GROWERS are reminded of the importance of reducing the winter carry-over of codling moth grubs to a minimum. The extent to which this is done will have an important bearing on the amount of infestation later

in the season. Where the winter clean-up of grubs is not carefully done, the problem of control is rendered much more difficult, but reduction in numbers of the first brood of moths means a reduction in the later broods.



Larva, Pupa and Adult of Codling Moth.

The seasonal work to be done includes the following tasks:—

Destruction of Overwintering Grubs.

The trunks of the trees should be scraped free of all loose bark, and the cracks and crevices examined for sheltering grubs. Broken branches should be removed, and all likely cocooning places for the following season's grubs should be filled in with putty or other suitable mixture. This should be a routine treatment, and may well be combined with pruning.

Removal of Bands.

Bandaging, although not compulsory in most districts, is a very valuable supplementary measure. Sacking bands should be examined and all sheltering larvae destroyed. A second examination in the spring should also be made if the bandages are allowed to remain on the trees, as grubs sheltering elsewhere sometimes move to the bandages before cocooning and emerging as moths in spring.

If chemically-treated bands are used these should be removed carefully, as numbers of grubs in cocoons against the trunk may fall to the ground when the removal of the bandage tears the cocoons. As the bands are not toxic late in the season when over-wintering grubs enter them, they should be burnt immediately, as they will be found to contain practically all live grubs. A kerosene tin with a few holes punched in the sides and having a long handle may be conveniently used for this purpose. A small fire is first made in the tin, after which the oil-soaked bands keep the fire burning, thus allowing the immediate destruction of grubs, bands and litter as each tree is treated.

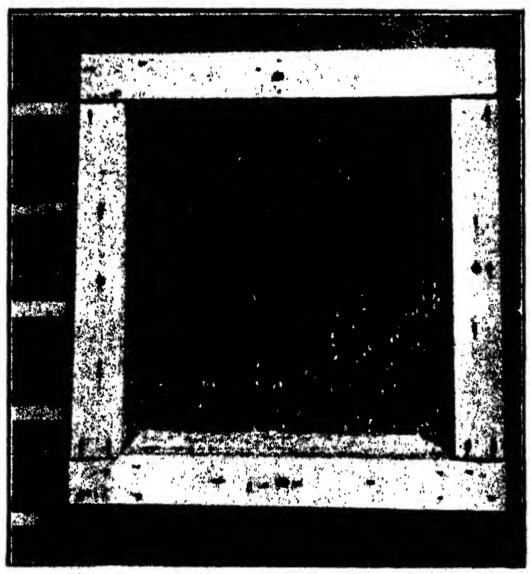
Packing Sheds.

As it is impossible to avoid bringing a certain amount of infested fruit into the packing shed, an attempt should be made to check this usually prolific source of grub carry-over. Every effort should be made to have the shed moth-proofed, or failing this, to make sure that all cases stored have been dipped. The grader and walls should also be examined and any sheltering grubs destroyed.

Treatment of Old Cases.

During harvesting a large quantity of infested fruit is packed into store boxes, and as the grubs readily shelter in such boxes,

(Continued on page 241.)



Moths at Screened Window of Packing Shed.

THE BUFFALO FLY.

Spread to New South Wales Possible.

G. L. McCLYMONT, B.V.Sc., Veterinary Officer.

THOUGH well-known to stockowners in the north of Australia as a serious parasite of cattle, the Buffalo Fly has not as yet caused direct concern to stockowners in this State. However it is continuing to spread, and recently, despite vigorous control measures, reached the eastern coast of Queensland whence its spread to New South Wales is possible.

The effect of this fly, should it reach our dairying districts, may be most serious, especially during the first period of attack, as cattle, during the first experience of infestation appear to be more sensitive to the irritation caused by the flies.

Although large numbers of flies, approximately 1,000 or more, can be carried before an animal shows signs of worry or irritation, the effects from the parasites when present in these numbers are pronounced, as feeding and resting habits are upset, cattle fail to thrive, milk yields fall and condition may be lost.

In relieving the irritation caused by the fly bites, cattle rub the affected areas against trees and other objects, forming large raw areas which are in themselves attractive to the Buffalo and other flies.

The Life History.

The fly, whilst primarily a parasite of the buffalo, attacks other animals such as cattle, horses, mules, donkeys and even man. However, in Australia, although it was introduced by the buffalo, it is chiefly a parasite of cattle.

Unlike most other blood-sucking flies, the Buffalo Fly, a small, dark-grey fly, about one-sixth inch in length (half the size of a house fly) remains on the cattle throughout its life, only leaving its host to lay eggs or when disturbed. Thus the spread of the fly is largely determined by the movement of cattle. The eggs are laid only in freshly-dropped dung of cattle and buffaloes, the fly darting from its host when the dung is passed to lay its eggs, and then quickly returning to the beast. After the eggs hatch the fly passes through the stages of larva

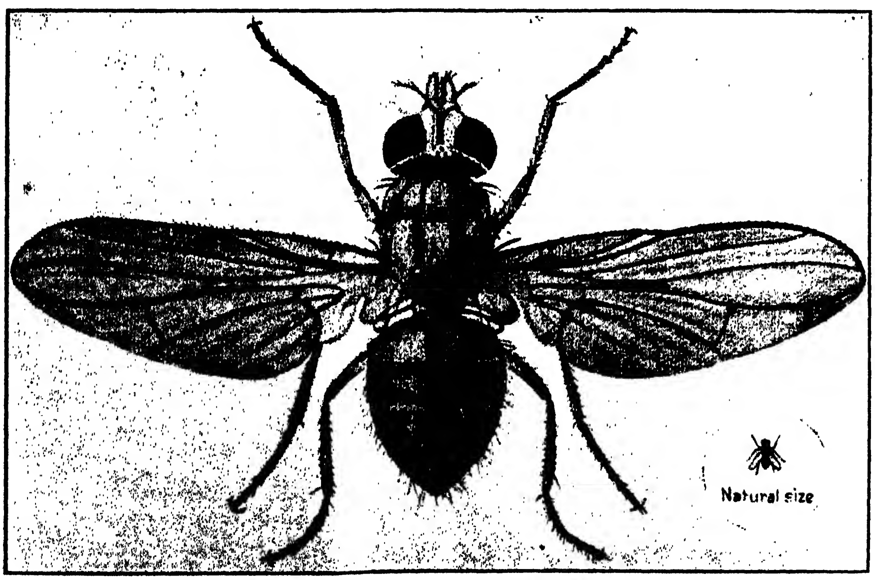


Fig. 1.—Buffalo Fly (*Lyperosia exigua*).

[*After Patton and Cragg.*

and pupa into the adult, finally emerging within about seven to eleven days, although under cool conditions this phase may extend to forty-six days. Cool, dry winter winds, as they quickly dry the dung and lower its temperature, are extremely unfavourable for the development of the fly. However, spring rains and warm conditions favour its reproduction.

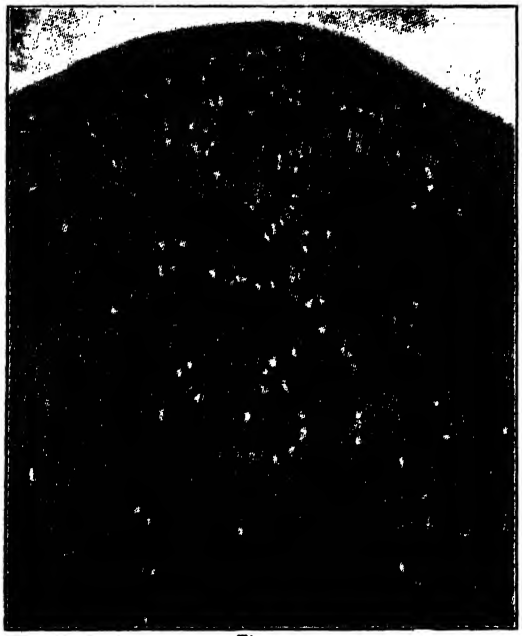


Fig. 2.
Heavy Infestation of Buffalo Fly on a Bull.
After Roberts.

Control Measures.

As eradication of the fly from affected areas has been found to be impracticable, all measures have been directed to preventing the spread of the parasite by controlling and restricting the movement of cattle, and ridding the cattle of their infestation by spraying when they are leaving affected areas. These measures, whilst vigorously applied, have failed to check completely the spread of the parasite.

Meanwhile, extensive researches on the possibility of discovering some insect which would parasitise and destroy the Buffalo Fly have been without success. However, research is still in progress on the production of more efficient spraying materials, and in particular those which might have a repellent effect against the fly and which would prevent re-infestation at least for some time after spraying.

As spraying with the present materials only has the effect of driving flies from the cattle and killing the few that are caught in the spray, whilst doing nothing to prevent re-infestation from flies hatching from dung, or the unsettling of the flies driven off, eradication or even diminution in numbers is impracticable on large holdings. However, on dairy farms regular dispersal of dung by harrowing may be adopted to reduce the fly population to below the critical "thousand flies per head" level. The harrowing, by breaking up the dung heaps, allows the mass to dry, and so prevents full development of the eggs of the Buffalo Fly.

Fig. 3.—Extensive Sores Caused by Buffalo Fly Around the Shoulder and Neck.
[*After Roberts.*

A Corner of the Hawkesbury Agricultural College Apiary During Winter.

Beekeeping Hints.

W. A. GOODACRE, Senior Apiary Instructor.

The Honey Flow Prospects are Good.

Make Preparations Now.

THERE is an excellent show of buds on the best of our honey-producing trees, and in consequence the prospects for flowering during the coming season, and for securing heavy extractions of honey in the most favourable producing centres of the State, are excellent. To make the most of production, however, the bee-farmer will need to go ahead with all possible preparation work during the winter months so as to be fully prepared to deal with the anticipated heavy honey-flows.

All hive material on hand should be thoroughly overhauled and made ready to put into immediate use when required in the apiary, and as we may expect a continuance of rationing of new hives at the factory, it should prove a wise plan to arrange to make up some home-made material. Supers may be particularly useful in providing additional accommodation for storage on the hives during heavy honey flows. Then again, every care should be taken to preserve the honey room plant, and any good, sound, used honey containers. The best plan is to cleanse thoroughly the various items with hot water, and then properly dry and air them before storing them in a dry room. It is assisting the war effort to take particular care of the plant, as experienced labour, and especially, useful material, are required to manufacture any replacements.

The Care of Surplus Combs is Important.

A number of bee-farmers suffered fairly heavy colony losses in the apiary during the past season owing to adverse conditions in the fields. As a result they have a number of hive-bodies and supers full of combs to care for through winter, and onward until such times as progressive conditions prevail to allow of them being re-established with bees; possibly the late spring or early summer. The importance of properly caring for the spare combs can scarcely be over-estimated, as the progress in replacing the lost colonies—building them up into useful units

of production—will largely depend on having combs available in good order to assist the bees in making a forward move. It takes much longer for bees to become established when damaged combs have to be used, or a start made by using comb-foundation only in the frames.

The surest way to keep surplus combs free from damage by wax-moth larvae is to place them under fumigation. A simple plan is to stack them in supers as shown in the accompanying illustration, care being observed, of course, to remove all propolis from the edges of the hive-bodies so as to ensure as tight a joint as possible. Each pile of supers should be erected on a good pad of paper placed on a level base. On top of the pile place an empty super body and insert a shallow vessel into which is poured a couple of ounces of carbon-bisulphide. Then over all, place a pad of paper and a weighted cover-board.

Points in Using Gas to Fumigate Combs.

The quantity of carbon-bisulphide mentioned is sufficient to fumigate a pile of, say, five full-depth supers of combs, or their equivalent in other sizes, and the length of time the gas will remain effective depends on the neatness of the job in fitting up the stack. Fumigation is best done in a sheltered place out of doors, and it must be kept in mind that the gas is poisonous, highly inflammable, and possibly explosive under certain conditions.

Many of our bee-farmers prefer to use paradichlorobenzene flakes for fumigation against wax-moth, as the gas from them is not so unpleasant to use, and it is not dangerous like carbon-bisulphide. A good sprinkling of paradichlorobenezene over the tops of the frames in each super as it is being stacked for fumigation should provide a sufficient strength of gas to prevent infestation of the combs by wax-moth larvae. A little extra should be thrown in about every three to four weeks, particularly during warm weather, as wax-moths then become more active.

A Supply of Comb-foundation is Essential.

That essential commodity, comb-foundation, is again likely to be in very short supply during the coming spring and early summer, and will, no doubt, be severely rationed to those who have not reserved a sufficient quantity of their bulk wax to forward to the factory to be manufactured into foundation. Even the beginner should make sure of his essential requirements—though it only amounts to a few pounds—by saving and processing every scrap of wax about the apiary, so that he will have sufficient bulk wax to fulfil the needs of the barter plan. Where no scraps of wax or cull combs are available for melting and processing, it may be a good plan

Applying Carbon Bisulphide to Top of Stack.

to contact a commercial bee-farmer with a view of purchasing a few pounds of bulk wax to hold in reserve.

It is possible to manage with make-shift parts of the hive, such as supers, covers, and bottom boards, etc., when supplies are affected by rationing, but little can be done without comb-foundation, which is required to induce the bees to build straight in the frames, and to ensure of good worker combs being constructed. Where the bee-farmer is forced, by rationing, to use strips of foundation instead of full sheets in the frames, it is important that the hive be set level on its

stand, although a slight dip toward the entrance does not matter. The point is, that bees build perpendicularly in the frames, as if using a sort of plumb line, and if the hive is not level across, the combs will not be built down straight in the frames, which makes manipulation extremely difficult.

Points in Using Strips of Comb-foundation.

The chief trouble about using strips of foundation is that the bees are likely to build an excessive amount of drone comb, and even with the best of arrangement it will be almost impossible to prevent the queen from gaining access to it, with the result that an over-supply of drones is raised

Bees Secreting Wax and Building Comb.
[*After Hutchinson.*

in the hive, a condition every bee-farmer desires to avoid. Then again, it cannot be expected that colonies will make such good headway in comb-building from strips as they would from full sheets with all the labour-saving advantages offered by the latter.

The best results in using strips of foundation in the frames are observed when a young colony is building up in strength in a single storey hive, or with a newly hived swarm. In these instances, in order to become firmly and readily established, the queen must be provided with all possible worker comb in which to form a brood-nest. The worst results obtained from strips are when they are used in frames in supers placed on populous hives for honey storage during a honey flow. The bees take the shortest cut in comb-building so as to avoid delay in providing storage space, and this short cut is offered in the construction of the larger drone cells. A whole mass of drone-comb may be constructed, making it necessary to exclude the queen from such supers.

Thus it will be seen how important it is to provide for adequate supplies for the future, or, in cases where strips have to be used, to employ them to the best advantage.

The Supply of Frames.

We hope that manufacturers will endeavour to provide adequate supplies of factory-made, standard-sized frames, as the average bee-farmer is not expert enough with tools to make really good frames, and so much depends on them being made an exact replica of the latest factory type. Hive-bodies or other bee-material of a make-shift type may be replaced when desired, but not so the frames when combs have been built in them, at least not without serious damage to the all-important combs.

The Apiaries Act.

FOR the welfare of the industry, bee-keeping is governed by certain regulations. The chief provisions of the Apiaries Act are are follows:—

1. All bees must be registered whether kept for commercial purposes or otherwise. A form for the purpose can be obtained from the Department of Agriculture, Box 36A G.P.O., Sydney.
2. The outbreak of any disease in bees must be reported at once to the Department.
3. To facilitate the work of apiary inspection, and the control and eradication of disease found in bees, bees may be kept only in properly-constructed frame hives, the use of box hives being prohibited. It must be observed also, that the bees build combs straight in the hive frames so that they may be readily removed for examination.

A penalty of £20 is provided under the Apiaries Act for neglect to observe any of the foregoing provisions.

Export to Queensland.
Certificate Required.

BEEKEEPERS are reminded that any honey exported to Queensland from this State must be accompanied by a certificate issued

(*Continued on page* 246.)

FEEDS and FEEDING NOTES.

FEEDING PIGS FOR PROFIT.

(*Concluded from page* 184.)

G. L. McCLYMONT, B.V.Sc., and F. H. W. MORLEY, B.V.Sc., H.D.A. Veterinary Officers; and F. BOSTOCK, Senior Piggery Instructor.

THIS is the third and concluding section of this article, which commenced in March issue. To date the authors have dealt with general principles of feeding, explained the functions of food constituents in the ration, and discussed the use and cost of various foodstuffs.

In this issue they deal with feeding pigs on wheat and dairy farms, and with the feeding of sows, suckers and boars.

Pig Feeding in the Wheat Areas.

Investigations and experience have forcefully shown that if fertility of the soil and returns from farms in the wheat areas are to be improved, there must be an increase in mixed farming. Sheep are the obvious stock to be used in this connection and are present on most wheat farms, but pigs can play a role no less important. Not only may a bushel of wheat often return more as pig meat than as grain, but a large proportion of the fertilising constituents of the grain are returned to the soil, thus decreasing the drain on fertility.

Even if it is not considered economical at the time to utilise a large proportion of the grain crop as feed, pigs can still play a valuable role on wheat farms by acting as a profitable avenue of disposal for low quality grain, such as cracked grain from the header, and for grazing off crops which have been flattened by hail or wind, and which otherwise would be a total loss.

Supplements Required With Wheat.*

Wheat, having a relatively low content of protein which is not of first-class quality, and being very low in calcium and vitamin A., is not suitable as a sole feed for pigs. As an indication of the extra returns obtained by supplementing wheat with protein concentrate, note the following figures from a South Australian experiment:—

Amount of wheat without meat meal required to produce a 1 lb. gain in a pig = 4.2 lb.

Amount of wheat with 7 per cent. meat meal required to produce a 1 lb. gain in a pig = 2.6 lb.

The extra efficiency obtained by supplementing with meat meal is obvious.

The cost of supplements is frequently advanced as a reason for failing to supply them, but in practice the added cost entailed by feeding the supplement is comparatively small and more than repaid by results. For example, adding 10 per cent. meat meal at £11 per ton to wheat at 3s. 6d. per bushel, only increases the cost per 100 lb. of feed from 5s. 10d. to 6s. 2d., that is, by about 6 per cent., whilst up to 40 per cent. more pig meat may be obtained from the same amount of grain.

*The following discussion, which refers to wheat, can be applied practically without alteration to barley.

Dairy by-products are excellent protein supplements for grain, but unfortunately they are rarely available in wheat areas, so that other sources of protein, such as meat meal, blood meal, and fish meal, must be used. However, if dried dairy by-products can be produced at satisfactory prices they will be excellent supplements for grain. For example, in the South Australian experiments, mentioned previously, a supplement of 10 per cent. dried whey was superior in financial returns and rate of growth to a supplement of 8 per cent. meat meal, even though the dried whey was £22 per ton and the meat meal £14 per ton. With these results in mind, it is not unreasonable to expect that dried butter milk or dried skim milk may be found to be more economical supplements for grain than meat meal, even though they may in actual cost per ton be higher than this supplement.

An adequate mineral supplement for wheat-fed pigs is 1 lb. salt and 1 lb. ground limestone per 100 lb. of feed (1¾ lb. salt and 1¾ lb. ground limestone per bag of wheat*). Green feed, 1-2 lb. per day, is an adequate Vitamin A supplement, but may be replaced by 5 per cent. of lucerne meal or first quality leafy lucerne hay in the feed, or ½ oz. of fish liver oil per pig per day.

Preparation of the Wheat.

As previously mentioned, the wheat should be coarsely ground if hand fed, and fed whole if given in self feeders. Soaking or boiling is not advisable or necessary, and damping is only advisable in certain circumstances, as mentioned beforehand.

Feeding of the Wheat and Supplements.

Several methods, different in detail, can be used to supplement the wheat with meat meal or other dry protein supplements.

(*a*) *Use a constant amount of meat meal*, ¼ lb. per day being sufficient, from weaning till slaughter, but at the same time increase the grain ration as the pig matures. (For barley and maize, this should be increased to ⅓ lb. of meat meal per day.)

*Approximately 180 lb.

(*b*) *Use a constant percentage of meat meal* from weaning till slaughter. This method is useful where self feeders are not used, as only one mixture of feed is necessary for all classes of pigs.

At Hawkesbury Agricultural College 7 per cent. of meat meal in the wheat (12 lb. meat meal to 1 bag of wheat*) has been used successfully. The disadvantage is that in the latter stages of growth the meat meal is probably in surplus supply and so is wasted, and in the early stages of growth, the percentage may be insufficient for maximum development.

(*c*) *Use wheat mixed with decreasing percentages of meat meal* as the pigs mature. This method is suitable for self feeders where different aged pigs are fed from separate self feeders, and has the advantage of supplying a high proportion of meat meal in the early stages of growth when it is most needed, and supplying a smaller proportion of meat meal as the pigs mature.

The following are the percentages for different aged pigs:—

1st month after weaning—10 per cent. meat meal (10 lb. meat meal to 90 lb. wheat or 20 lb. meat meal to 180 lb. wheat).

2nd month after weaning—7½ per cent. meat meal (7½ lb. meat meal to 92½ lb. wheat or 15 lb. meat meal to 180 lb. wheat).

3rd and 4th month after weaning—5 per cent. meat meal (5 lb. meat meal to 95 lb. wheat or 10 lb. meat meal to 180 lb. wheat).

5th month after weaning—None

It will be noted that in the last method meat meal may be dropped entirely over the last month of finishing, and this can well be applied to the other methods without ill effect on the carcase quality or growth rate. *The quantity of meat meal used in all these methods is about equal, being about 30 lb. for a light baconer.*

Quantities of Grain for Growing Pigs.

The accompanying table gives the average quantity of feed required for approximately maximum growth rates. The quantity stated is the amount of total feed required, *i.e.*, total of grain and protein supplement. Thus a 4 lb. ration for pigs of 16 weeks could be 2⅜ lb. grain and 1 gallon skim milk (1 gallon of skim milk being equivalent in food value to about 1⅝ lb. grain) or 3¾ lb. grain and ¼ lb. meat meal, or 4 lb. of a grain-meat meal mixture, and so on.

	Average Live-weight with Full Feeding.	Average Feed Consumption per day.	Remarks.
	lb.	lb.	
Birth ...	2–2½	...	Sows milk only, until 3 weeks old.
3 weeks ...	12	½	Commence creep feeding
4 weeks ...	16	1	
6 weeks ..	25	1½	
8 weeks ...	35	2	Wean at 8 weeks.
10 weeks	47	2½	
12 weeks	60	3	
14 weeks	75	3½	
16 weeks	90	4	
18 weeks	107	4½	Porker weight 100-120 lb. live weight.
20 weeks	124	5	
22 weeks	142	5½	
24 weeks	160	6	Light baconer weight.
26 weeks	180	6¼	
28 weeks	200	6½	Heavy baconer weight.

* Approximately 180 lb.

This table only applies to pigs being fed mainly on grain and protein supplements, and does not apply to pigs obtaining a large portion of their requirements from grazing, as in this latter method, daily gains are lower and marketing time accordingly postponed. Further, these quantities should not be rigidly adhered to, as strains of pigs vary in their ability to convert feed to meat and in growth rates. Thus a 6 lb. ration for finishing baconers may lead to over-fatness with some strains, and so should be lowered, but may lead to laying on of insufficient condition with other strains, and so should be increased. That is, the figures are only a rough guide and need not be strictly adhered to.

Which Feed Rates Are the Most Economical.

It is frequently asked whether it is most economical to feed grain in self feeders, feed the pigs as much as they will eat once or twice daily, or feed only limited amounts of grain daily.

In general, it may be said:—

(*a*) Feeding grain in self feeders, although it may occasionally require more grain to produce a pound of grain, is usually more economical than hand feeding because the grain need not be crushed, labour is saved, and pigs make more rapid gains.

(*b*) Full hand feeding is usually more economical than restricted feeding; even though less grain is fed per day with the second method, the total amount of grain to produce a marketable pig is greater, on account of the longer time over which the pig must be fed.

Supplementing Wheat by Grazing.

Good grazing can considerably reduce the amount of grain and protein supplement required to produce a porker or baconer.

Under a European scheme known as the "Lehmann System," pigs of all ages are given a basal ration of about 2 lb. of mixed grain and protein supplement, and allowed to fill the remainder of their requirements from grazing on crops or pastures or from such foods as potatoes or sugar beet tops. By this means a weaner obtains practically all its nutritive requirements as grain and protein supplement, but obtains more and more of its requirements from grazing as it matures and becomes more able to handle such material.

By this means, also, up to 50 per cent. of the grain required to produce a baconer may be saved, even though the finishing time may be delayed by 4-6 weeks. The carcases produced by this method are, usually, not of markedly inferior quality, but may be heavier in the bone and thinner in the back fat than pigs wholly grain fed, so that for the final weeks of finishing, pigs could be transferred to a full grain ration.

This scheme could well be applied to the wheat areas of New South Wales, lucerne (irrigated, if necessary) being the grazing crop for choice. Crops such as oats, wheat, or barley could be used as grazing crops during the winter, or sows could be maintained on good leafy lucerne hay and a little grain. The best results from lucerne grazing will be obtained when care is paid to the management of the lucerne stand, as discussed early in this article, and on which detailed advice can be obtained from the Department.

As grazing on lucerne may predispose to sensitization of the skin of pigs to the sun's rays, adequate shade should be provided with this grazing.

Where lucerne is the supplementary grazing for grain, a considerable saving in protein supplement may be effected owing to the richness of this feed in protein. Thus the grain ration for pigs on lucerne can be 2 lb. of a mixture of 180 lb. of wheat and 6 lb. meat meal. Where other crops are used the grain ratios could be 2 lb. of a mixture of 180 lb. of wheat and 12 lb. meat meal.

By grazing on first quality mixed pasture or fodder crops, pigs can be brought to near bacon weight without any grain feeding, but finishing time is considerably delayed and carcase quality is not good. However, finishing on wheat would probably remedy the last disadvantage to some extent.

Feeding Old Sheep to Pigs.

Sheep men are frequently faced with the problem of the profitable disposal of cast-for-age or poor conditioned sheep. An avenue for disposal, which has been used with apparent success, is to boil down the sheep and use the resultant meat and soup as a protein supplement for grain- or pasture-fed pigs.

By experience it has been found that three or four boiled down sheep of approximately 50 lb. liveweight (30-35 lb. dressed weight) supply sufficient protein to act as a supplement for a pig from weaner to bacon weight. Meat meal required over this period would be about 30 lb., costing, with meat meal at £11 per ton, about 3s. 4d.; that is, each sheep is worth about 10d. to 1s. 1d. as a replacement for meat meal. Added to this return is the price obtained from the skin, and if a market is available, for the bones and tallow.

Not taking into account fuel and labour costs, it would appear that if old sheep can be bought at a price less than about 1s. 6d. above the expected return for the skin, such buying should be a profitable investment.

Pig Feeding in the Dairying Areas.

DENMARK carries nearly twenty-five pigs per ten dairy cows. Few of our dairy farms carry ten pigs per ten dairy cows, and many carry only one sow to six cows. In Denmark pigs are regarded as a very profitable part of the dairy enterprise. Here pigs are too often regarded as a sideline necessary to dispose of waste by-products.

The reasons why most dairy farmers in this State do not give pigs the attention they deserve appear to be:—

(1) Failure on the part of farmers to realise the value of dairy by-products for pig feeding, when combined with grain or other foods. There is a strong tendency to consider a valuable by-product, separated milk, as a nuisance to be disposed of at a minimum of inconvenience.

(2) Poor husbandry methods, poor housing and poor layout of piggery, due to lack of appreciation of the fundamentals of pig keeping.

(3) Shortage of labour and capital necessary to develop the pig section. This factor is often exaggerated, as in most dairying areas cheap but suitable buildings can be erected from second grade and bush timber. Care of pigs on dairy farms actually requires little extra labour, provided layout and housing are suitable.

(4) The seasonal nature of dairying, with the large surplus of by-products available during the flush of the season, followed by a period when supplies of skim milk drop to quantities that are too small to maintain breeding or fattening operations. Thus, instead of producing two litters per year, many dairy farmers only breed once a year from their sows. This makes weaner costs so much higher, that profits are cut to a much smaller margin.

One or Two Litters.

It is frequently argued by dairymen that it is not economical to produce two litters per sow per year, because of the high cost of purchased foodstuffs. However, in this State, where grain is relatively cheap, it is much less economical to keep a sow for twelve months, and only obtain one litter from her.

The present tendency to conserve fodder, with more reliable supplies of milk in periods of drought, should assist pig raisers to plan production operations through periods of feed shortage.

It is essential that breeding be planned to meet anticipated supplies. Control of farrowing dates so that the pigs are at a stage where food requirements are at a maximum just where the main flush of feed is usually expected, is possible. Thus in a district like the North Coast, where November to April are the months of flush growth, farrowing may be planned to take place in February to April, and again from August to October. A typical example is shown in the accompanying graph. A man with four sows mates two in October, one in November and another in December to farrow in February, March and April, respectively. These litters are sold as pork, but may be carried on to bacon weights if feed supplies are available, and prices warrant it. The sows are mated again in April, May and June to farrow in August, September and October. These litters are then available to consume the surplus of skim milk available in the period of flush, January, February and March.

The accompanying graph shows the normal butter production at Grafton and the calculated curve for feed requirements of pigs mated as described and based on producing eight* pigs per litter. A period of feed shortage is seen to exist in May, June and July.

The period of feed shortage indicated in the graph can be overcome in three ways:—

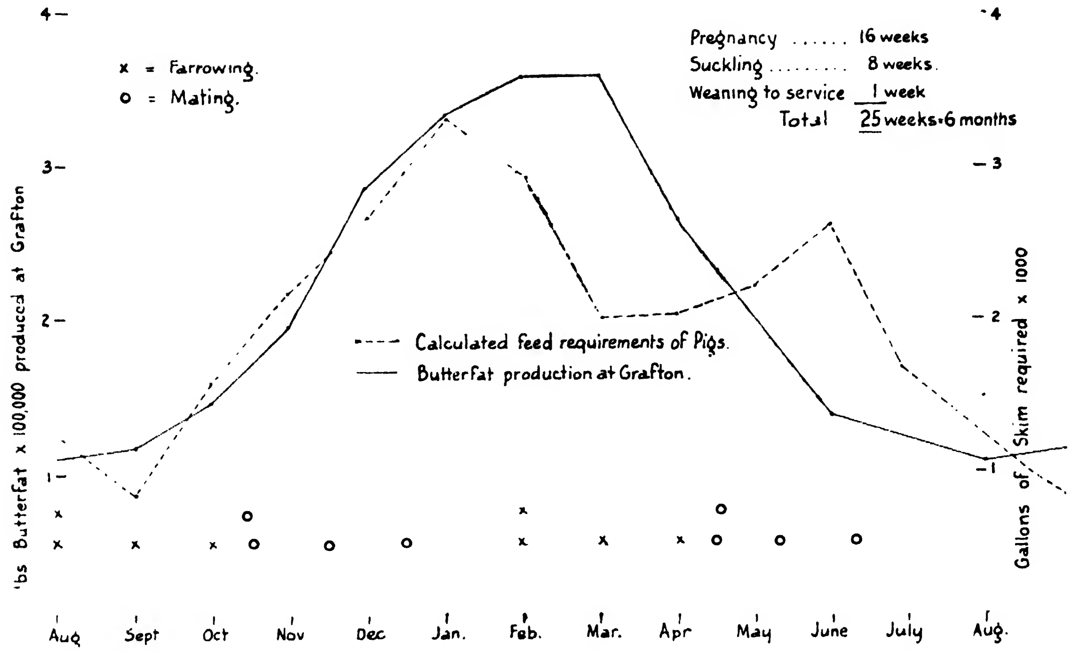
(1) Growing crops such as turnips, rape or artichokes, which can be used during this period.

(2) Using home-grown or purchased grain.

(3) Sale of young pigs as stores.

It is possible to produce 30 to 40 lb. of pig flesh (dressed weight) for each 100 lb. butter fat sold off the farm. Valuing this pig flesh

* Although this is based on rearing eight pigs per litter, it is realised that in some cases the average number reared is no more than five or six pigs.



Planned mating enables the best use to be made of skim milk supplies. Feed shortages in winter can be met with home-grown or purchased foodstuffs.

at 6d. per lb. on the property, this would mean an increased return of about 2d. for each pound of butter fat produced—a very effective subsidy obtained by but a little extra labour and capital expenditure.

Amounts to Feed.

One gallon (10 lb.) of skim milk or butter milk is equal to about 1⅝ lb. of dry feed. If using these by-products, the dry feed intake could be about on the same scale as in the table for wheat feeding, but replacing 1 lb. of grain by 6 lb. of skim or butter milk.

Feeding the Brood Sow.

Growth rates in pigs are largely determined during and before the first few weeks of life—that is, if only nutritional factors and not hereditary factors are considered. It seems that the number of pigs in a litter is largely determined by the level of feeding at mating, and the size of the new born pigs by the level of feeding shortly before farrowing. Therefore, it is essential that the correct feeding of the brood sow should receive the greatest of attention at these stages.

During pregnancy sows may be maintained on grazing alone, if this is of good quality, but if only of mediocre quality it should be supplemented with a little skim milk or meat meal, and if condition is lost on the pasture, by an allowance of grain. Loss of condition should be especially watched during the latter part of pregnancy, during which time most growth is made by the unborn pigs. If grazing is not available, 4 lb. of grain per day will be found sufficient for mature sows, but for maiden sows, which are still growing, the amount should be increased to 6 lb. per day.

Feeding during pregnancy should aim at having the sow in reasonable condition at farrowing, so that the sow's body will contain adequate reserve to allow of a good milk flow. Over-fatness at farrowing may lead to difficult births and overlying of suckers, and going to the other extreme, poor condition will lead to the birth of small suckers, poor milk flow and stunted weaners. Green feed should also be made available to sows, as the Vitamin A content of the milk depends solely on the Vitamin A content of the sow's feed. Without adequate Vitamin A in the milk, suckers will become extremely susceptible to infection.

About ten days before farrowing the sow should be drafted to a farrowing pen, with exercise yard attached, so that she may become used to her surroundings. For a day after farrowing the sow's diet should be limited to water and bran or skim milk. The food is then gradually increased over the next few days, so that a pig being wholly fed on grain would be receiving 10 to 12 lb. of grain with 1 or 2 lb. of meat meal, or 1½ gallons of skim milk, within a few days. These quantities are only approximate and should be guided by observation of the condition of the sow and the suckers. Grazing could reduce the amount of grain necessary for suckling sows, but it is not advisable to rely entirely on grazing for the nutrition of the sow at this stage. A mineral supplement of 2 oz. of a mixture of equal parts of ground limestone and salt is also advisable. Usually some condition is lost by sows

at the peak of milk production, but if the sow has farrowed in good condition this loss is of little consequence.

As the peak of milk production is passed at about three to four weeks after farrowing the ration may be progressively decreased, and two or three days before weaning the ration may be cut down to 2 or 3 lb. of grain per day, and the water supply limited. The suckers are then removed out of sight and sound of the sow. This method of weaning is probably preferable and less troublesome than the method of returning the suckers to the sow for a few hours for the next few days.

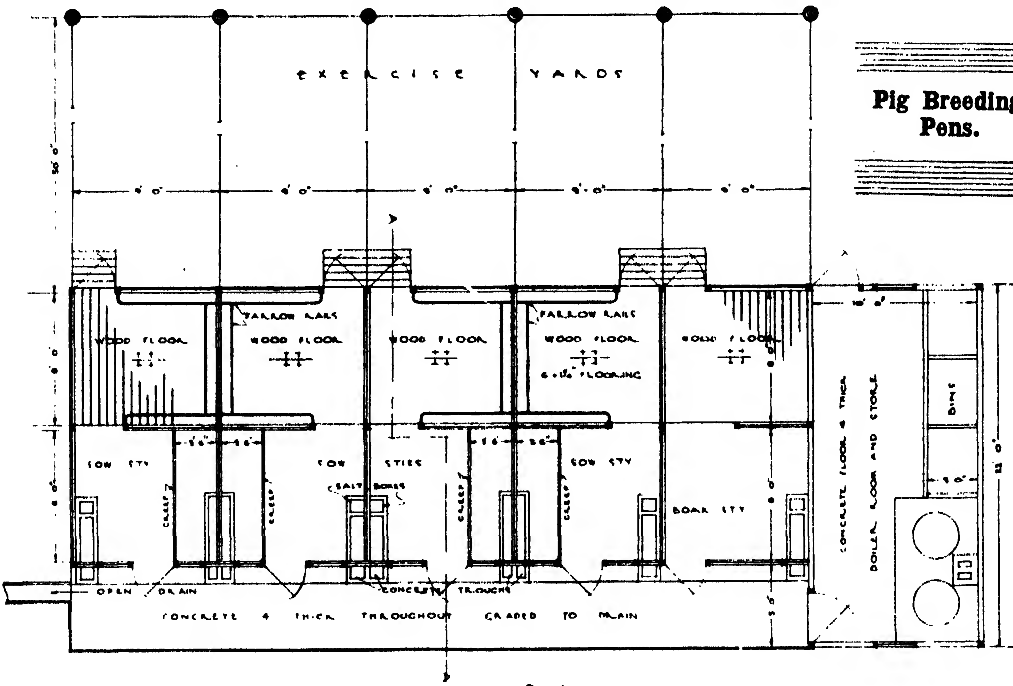
whey. By this means suckers are brought to a maximum weight at weaning time and being accustomed to dry feed, suffer less check when weaned. As weaning weight has a marked influence on subsequent growth, the value of creep feeding cannot be over-emphasised.

As indicated in the previous section on mineral requirements, anaemia of suckers due to iron deficiency must be guarded against.

Feeding the Boar.

Boars will maintain condition on 2 to 4 lb. of grain per day, providing they are not overworked. If heavy demands are to be made on

Pig Breeding Pens.



PLAN

Feeding the Suckers.

Milk production of sows reaches a maximum at about the end of the third week after farrowing, and declines thereafter; and also about this time suckers will take an interest in their food. Thus suckers should be introduced to supplementary feed at this time so that they will not experience a check to their growth and will become accustomed to their new feed. Creep feeders are an excellent method of carrying out this feeding. Part of the pen is fenced off so that the suckers, because of their small size, can have access to some supplementary feed, although the sow is prevented. A suitable and simple type is shown in the accompanying plan. Suitable mixtures for creep feeding are 1 gallon of butter milk or skim milk with 2 lb. of pollard, or grain meal or pollard with 15 per cent. meat meal, dried skim milk, dried butter milk, or dried

their services, then additional grain may be found necessary. It is important, especially as regards the fertility of the boar, that ample green feed be always available. In fact, boars may be maintained wholly on green feed except for a short period before and while their services are required.

Conclusion.

Although much is known of the science of pig feeding, there are still many aspects concerning which little or nothing is known. Vast fields of research are open to the scientific investigator and many problems have to be solved by the individual farmer. However, pig farmers may feel confident that sound methods of breeding, housing, disease control and management, with proper use of present knowledge of feeding, will produce a profitable and interesting addition to their farming activities.

Talking Will Not Win the War. It May Lose It.

Current Feeding Costs.

Feed.	Starch Unit Value per 100 lb.	Protein Unit Value per 100 lb.	Cost.	Cost per Starch Unit.	Cost per Protein Unit.	Remarks.
			ROUGHAGES.			
Lucerne hay or chaff...	35–40 (Av. 45)	10	£7 10s.–£8 10s. long ton*	2d.–2·3d.	..	Roughage still more expensive than concentrates. Home-grown roughage best wherever possible.
Oaten chaff	40	3	£7 5s.–£7 10s. long ton*	2d.	...	
Wheaten chaff ...	40	3	£6 15s.–£7 5s. long ton*	1·8d.–2d.	...	
Oaten hay	33	3	£8–£10 long ton* ...	2·8d.–3·3d.	...	
Wheaten hay	33	3				
			STARCHY CONCENTRATES.			
Wheat	72	8	3s. 7d. per bushel in truck lots—bagged. 4s. 2½d. small lots—bagged.	1d.	...	Cheapest source of starch, and available in large quantities.
Wheatmeal	72	8	£7 5s. per short ton† ...	1·2d.	...	
Maize	78	8	6s. bushel	...	..	Too expensive.
Maize meal	78	8	£12–£13 per short ton†	1·8d.–2d.	...	
Barley	71	7	3s. bushel	1d.	...	As cheap as wheat. Will probably pay to crush own grain.
Barley meal	71	7	£7 5s. short ton† ...	1·2d.	..	
Oats	62	8	2s. 9d. bushel	1·5d.	...	Not as good buying as wheat or barley.
Crushed oats	62	8	3s. 6d.–3s. 9d. per 40 lb.	1·7d.–1·8d.	...	
Pollard	66	10	£6 short ton†	1·1d.	...	Pollard good buying when available.
Bran	56	10	£6 short ton†	1·3d.	...	Worth buying for poultry and for leavening dairy rations.
			PROTEIN CONCENTRATES.			
Linseed meal	72	25	£9 10s.–£10 per short ton.†	1·6d.–1·7d.	4·5d.–5d.	Supplies fair and so the most available of the oil meals.
Peanut meal	78	43	£6 10s. short ton† ...	1·1d.	1·8d.	Limited stock. The cheapest protein.
Cocoanut meal ...	76	15	£7 per short ton† ...	1·1d.	5·1d.	Some supplies should be available soon.
Meat meal	80	55	£10 10s. short ton† ...	...	2·3d.	Supplies fair.

* Long ton—2,240 lb. † Short ton—2,000 lb.

MINERAL SUPPLEMENTS.

Mineral.	*Cost.*	*Supplies.*
Ground calcium carbonate (ground limestone)—a calcium supplement.	30s. 6d. per short ton in bags truck lots.	Supplies should be available soon.
Bone meal (a calcium and phosphorus supplement)...	£14 10s. per short ton...	Fair supplies.
Bone flour (a calcium and phosphorus supplement)...	£11 15s. per short ton less 15 per cent.	Supplies should be available soon.

Another Departmental Telegraphic Address.

IN order to facilitate and reduce the cost of sending telegrams to the Division of Animal Industry of the Department of Agriculture, the telegraphic address "Animalind Sydney" has been registered with the Postmaster-General's Department. It should be used in all cases where telegrams relating to live-stock matters are sent to the Department of Agriculture.

Insect Pests —*continued from page* 230.

some treatment will be necessary to check this source of carry-over. Dipping the boxes in boiling water for a period of 3 minutes is satisfactory, or the boxes may be stored in a moth-proof packing shed, and the moths which emerge in the following spring may then be killed. The moths tend to collect about the windows, in their efforts to leave the shed, and a check on their emergence can easily be made by periodical examinations.

During the winter period a waste fruit pit may be constructed for the disposal of infested fruit in the coming season. These pits, which are compulsory in certain districts, provide the easiest and most satisfactory way of disposing of fallen and infested fruit. Burning and boiling, while efficient if thoroughly carried out, require more labour, and consequently there is a tendency to neglect this work until a sufficient quantity of fruit is on hand to make it imperative that the fruit be treated.

Beef Cuts and Their Use in Cooking.

CERTAIN cuts of beef are commonly referred to as the "higher-priced" or "better" cuts. They come from the parts of the animal which receive the least amount of exercise and are therefore naturally more tender than cuts from the parts which are well exercised. On account of their tenderness, fine flavour and ease in preparing and cooking and the fact that they comprise only about 25 per cent. of the whole beef animal, they are in greatest demand and consequently command a higher price than the less popular cuts which make up the other 75 per cent.

When buying porterhouse or sirloin steak it must be remembered that a part of the price is for attractiveness, popularity and ease of preparation. A more general use of the various cheaper cuts will not only help in balancing the meat bill, but will greatly assist in adding variety to the menu, as a greater variety of beef dishes can be served at less cost, or served more frequently at the same cost. These cuts are fully as nourishing and digestible as the others, and the very exercise that is responsible for their coarser fibre and difference in texture has developed large amounts of extractives which give them their fine flavour. It will be seen, therefore, that the lower price at which these cuts sell is not an indication of inferior flavour, food value or digestibility, and that if properly cooked they furnish a very palatable, nutritious and economical dish.

The following chart of the cuts of beef and the uses to which they may best be put when cooking, will be of interest to the farm womenfolk.

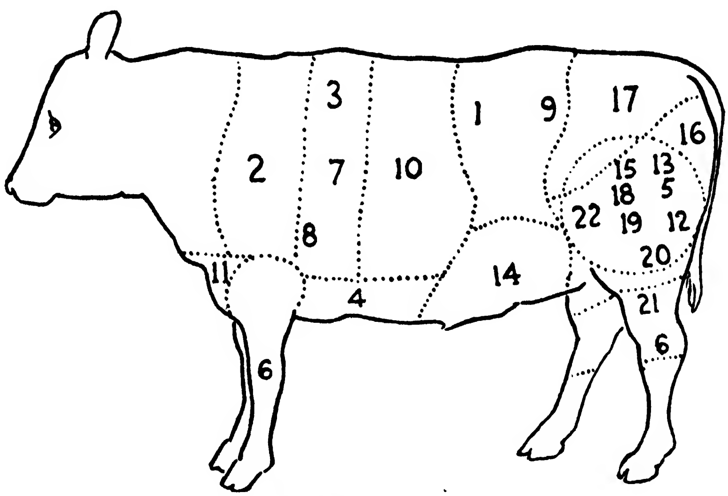


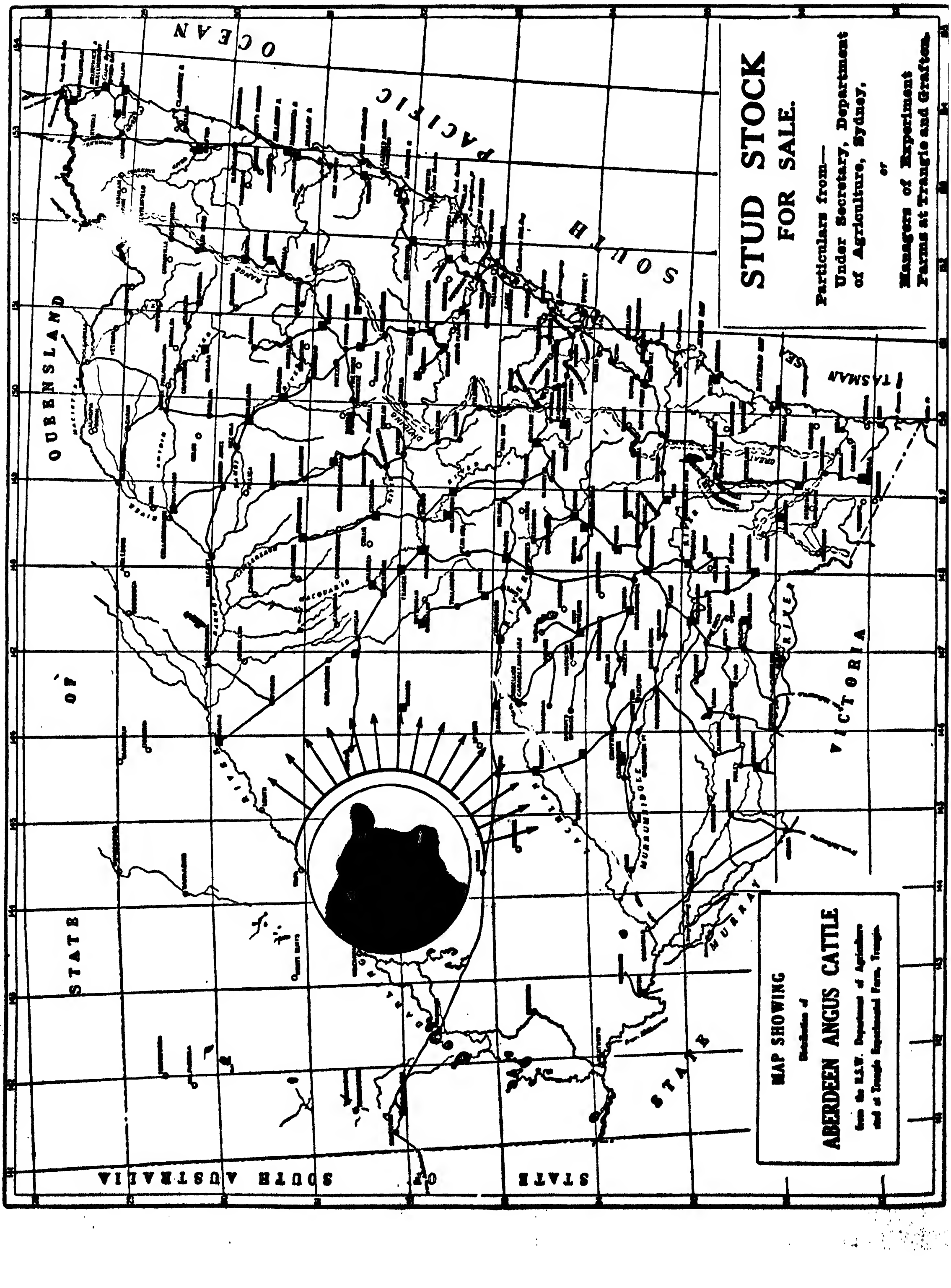
DIAGRAM OF BEEF CUTS.

1. Wing Rib	Roasting.
2. Chuck and Blade Bone Steak	Puddings and Pies.
3. Back Ribs	Braising.
4. Brisket	Salted or Fresh.
5.*Topside–Cross Cut ...	Roasting.
6. Shin of Beef	Stewing.
7. Flat Rib	Roasting.
8. Bolar Roast.	
9. Sirloin	Roasting, and Porterhouse Steak.
10. Ribs Rolling	Roasting.
11. Brisket	Pickled or Fresh for Boiling.
12. Topside or Steak.	
13.*Buttock or Topside Steak.	
14. Flank	Braising.
15.*Silverside	Salted or Fresh.
16. Aitchbone	Roasting or Salted.
17. Rump Steak	Grilling and Fillet Steak inside rump.
18. Silverside–Cross Cut ...	Salt or Fresh.
19. Silverside	Salt or Fresh.
20.*Topside or Steak.	
21. Leg of Beef	Puddings and Pies.
22. Thick Flank	Roasting.

* Nos. 5, 13, 15 and 20, marked in the circle, are cuts from the inside of the leg.

IN the dry spell that has occurred during the late summer in dairying districts, lucerne has proved of great value in providing green feed to balance failing pastures and for conservation as hay. Its deep-rooting system enables it to maintain green growth much longer than pastures, whether natural or improved.

OF the butter graded by State Butter Graders during the month of March, 93 per cent. has been found to be of choicest grade.


STUD STOCK
FOR SALE.
Particulars from—
Under Secretary, Department
of Agriculture, Sydney,
or
Managers of Experiment
Farms at Trangie and Grafton.
MAP SHOWING
ABERDEEN ANGUS CATTLE
SOUTH PACIFIC OCEAN
TASMAN SEA
STATE OF QUEENSLAND
STATE OF VICTORIA
STATE OF SOUTH AUSTRALIA
MURRAY
MURRUMBIDGEE

Control of Internal Parasites in Pigs.

The Value of Good Hygiene.

G. L. McClymont, B.V.Sc., Veterinary Officer.

THOUGH phenothiazine is an efficient drug for the treatment of round worms in pigs, this fact does not warrant failure to adopt those hygienic measures which could largely prevent worm infestation, so avoiding the necessity for treatment and eliminating the check which young pigs suffer when infested with worms.

The value of such good husbandry is well brought out in the following figures from American experiments on control of worms by hygienic measures only:—

	Pigs raised Under Unhygienic Conditions.	Pigs raised Under Hygienic Conditions.
Average number in litters at 4 months	5·1	7·1
Percentage of runts at 4 months	18%	1%
Weight of pigs at 4 months	68 lb.	86 lb.
Age of pigs at marketing	10 months 15 days	7 months 5 days
Gain per day	0·6 lb.	0·86 lb.

2. Wash the sides and udder of the sow with soap and water before placing her in the farrowing pen. This will remove worm eggs from the coat so that they will not infect the young pigs when sucking.

3. Regularly remove droppings from the farrowing pen so that the worm eggs that may be in the sow's droppings will not have time to mature and so infect the young pigs.

4. Within ten days of farrowing, transfer the sow and litter to a pen which has been cleaned as above, or a paddock which has been rested from pigs for as long as possible, at least some months, and cultivated and cropped.

5. Remove the sow when the pigs are weaned and retain the pigs in the clean pasture or pen till they are at least four months old, at which age they are not so susceptible to the effects of worm infestation.

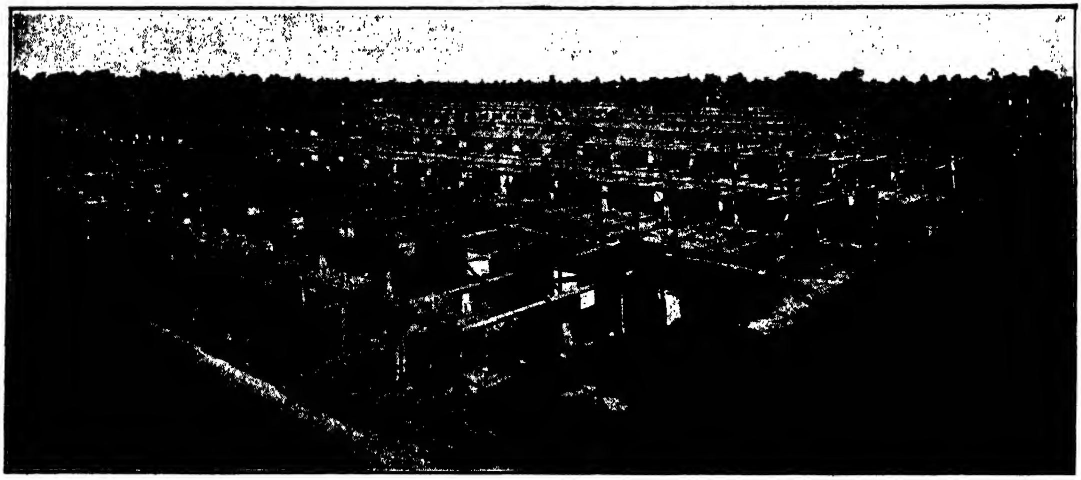
These Pigs are About the Same Age.

The one on the right is a typical runt, showing the effects of worm infestation and other troubles caused by dirty piggeries. The other pig, raised under hygienic conditions, is normal and healthy.

The measures which were adopted in order to bring about these results were the following:—

1. Scrub farrowing pens with a solution of 5 lb. caustic soda to 10 gallons of boiling water. This will kill the worm eggs and also destroy any organisms of infectious diseases which may be present. Because of its caustic nature, care must be taken to keep the solution off the body.

The practicability of adopting these measures depends largely on the methods in operation on each farm, but their desirability cannot be questioned, for not only would their adoption assist greatly in controlling round worms, but would also tend to control kidney worms for which no effective treatment is known and thus prevent most of the annual loss caused by this parasite as a result of the condemnation of carcases and organs.



The Competition Pens at Hawkesbury Agricultural College.

Poultry Notes.

May, 1943.

E. HADLINGTON, Poultry Expert.

Comments on the 1942-43 Egg-laying Competition at the Hawkesbury Agricultural College.

IT will be noted that there were only seventy entries in this competition instead of the usual ninety, or 420 birds compared with 540. This was the first occasion on which insufficient entries were received to fill the pens, and no doubt wartime conditions were partly to blame. Had it not been for the reduction of the pens by half this year, there would also have been less applications than necessary. It should be realised that a continuance of such a lack of support in the future might have undesirable repercussions.

However, it is pleasing to see that the general average production in the competition just concluded, although somewhat lower than last year, which was a record, was higher than for a number of years prior to last, being 206.4 compared with 210.

The averages for the different breeds compared with those for last year were as follows.

Breed.	Average Egg Production.
1942–43.	
300 White Leghorns	207.1
6 Minorcas	181.8
90 Australorps	205.4
18 Black Langshans	216.1
6 White Langshans	182.5
1941–42.	
402 White Leghorns	214.3
96 Australorps	200.5
24 Black Langshans	215.8
6 Buff Orpingtons	150.1
12 Rhode Island Reds	181.5

The Black Langshans again put up a higher average than the other breeds, and it is a matter for regret that the leading pen was disqualified for group prizes by the slightest fraction in weight of eggs of one bird. The leading pen of Australorps was also similarly disqualified.

There were no outstanding individual or group scores, the highest individual being that of Mr. W. H. Dundon's hen which laid 283 eggs and the highest group total of 1,477 eggs was put up by Mr. W. F. Argall's pen.

Main Prize Winners.

It is pleasing to see some new names amongst the list of prize winners, and Mr. W. F. Argall must be congratulated upon carrying off the two major prizes, the Grand Champion and Golden Egg. Mr. C. Harris and Messrs. Tyson Bros. also deserve credit for winning respectively the Grand Champion and Golden Egg Consolation trophies.

The Robinson Prize of £10 10s. donated for the highest quality points for pullets in the competition, combined with those awarded for cockerels in the cockerel exhibition, went to Wimbleford Poultry Farm. The groups of two other competitors (Messrs. Judson and Hoe) secured higher points, but failed to lay the required 1,250 eggs.

Full Report of Egg-laying Competition.

FULL details of the 1942-43 Hawkesbury Agricultural College Egg-laying Competition are available in leaflet form and will be supplied on application to the Department, Box 36A, G.P.O., Sydney.

The J. Hadlington Commemoration Medal awarded on points for weight and quality of birds and also weight of eggs was won by Mr. N. F. Judson.

Mortality.

The mortality rate was slightly lower than the average in these tests, being approximately 5 per cent. The actual number of birds which died or were replaced owing to sickness was twenty-four, including two which were taken by foxes.

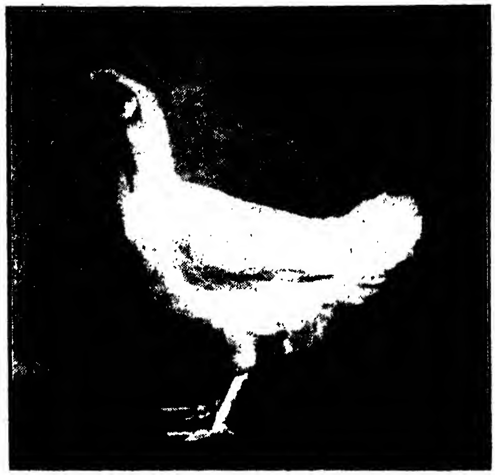
Underweight Eggs.

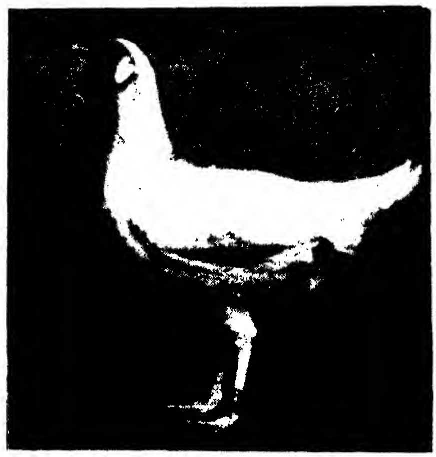
The number of birds disqualified on account of laying under-weight eggs or failing to lay the required number of eggs during the weighing period was as under:—

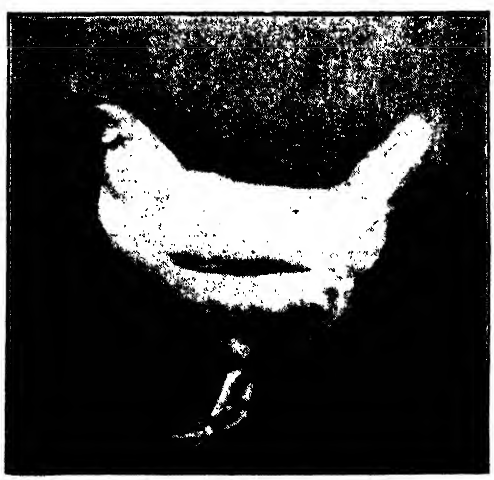
Light Breeds.—Thirty-five individual birds and twelve groups.

Heavy Breeds.—Fourteen individual birds and three groups.

Of these, six individuals and five groups in the light breeds and one individual and one group in the heavy breeds were due to







Three of Mr. W. F. Argall's White Leghorns. This competitor won the Grand Championship and the Golden Egg.

not laying the required number of eggs during the weighing period. Comparing these figures with last year, the smaller number of birds in this competition must be taken into consideration; thus the percentages of disqualifications are slightly higher than last year.

Observations on Moulting.

During the first half of the test, observations were made from time to time on the number of hens moulting among the light breeds. Inspection on 22nd April showed that twenty-four birds had commenced a partial or complete moult; on 14th May, thirteen others were moulting, and on 25th June ten more had commenced to moult. On 6th August only two birds were moulting, and on 10th September all were through the moult and in laying condition.

Of the twenty-four which were moulting on 22nd April, nine were back in laying condition by 14th May; ten others by 25th June, and the balance by 6th August.

Of the thirteen which commenced to moult on the 14th May, ten had resumed production by 15th June and the balance by the 6th August. The ten which were moulting on 25th June had also resumed with the exception of two on the 6th August.

It is probable that some of the birds actually commenced to moult between the different inspection dates and resumed production somewhat earlier than shown.

The figures show that 16 per cent. of the Leghorns moulted during the first six months of the competition. No record was kept of the heavy breeds, but from observations it would appear that only a small percentage moulted during this period.

Return Over Cost of Feed.

The cost of feeding in this test was only 1d. lower than for last year, the figures being 7s. 11d. and 8s. respectively. However, the average return for eggs shows a great improvement, and taking the production on a commercial poultry farm at 12 dozen eggs per hen per annum, the average return works out at 1s. 5d. per dozen net after allowing for marketing deductions, or 17s. per hen, which leaves a profit of 9s. 1d. after deducting the cost of feeding. This figure is comparable with 4s. per hen last year, which was the lowest return on record. These figures, of course, do not relate to the return from the birds in the competition which will be found in the table of results published in a separate leaflet giving details of the competition, copies of which may be obtained from the Department.

Beekeeping Hints.

(*Continued from page* 235.)

by the Department of Agriculture. When the regulations are not complied with, consignments are held up at the border of Queensland, or port of call if sent by boat, and as a result a good deal of troublesome inquiry and delay occurs in getting the consignment through.

Certain demands are made in the certificate concerning inspection of the apiaries from which the consignments are to be exported, and it is obvious, therefore, that intending exporters of honey should give ample notice to the Department so that the inspection requirements can be carried out according to the regulations.

As the Department is put to some expense in attending to inspections, etc., in connection with the issue of certificates, a small fee is charged on the following scale:—

Certificate for any one consignment to 120 lb.	1s. 6d.
Certificate for any one consignment 121 to 480 lb.	2s. 6d.
Certificate for any one consignment over 480 lb.	5s. 0d.

It isn't clever to talk of military matters.

It's Disloyal.

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
		1943.
F. and C. Ryall, 5 Western Avenue, West Wollongong	57	1 May.
New England University College, Armidale	13	1 „
Parker Bros., Hampton Court Dairy, Inverell	104	1 „
A. D. Frater, King's Plain Road, Inverell ...	106	1 „
R. C. Dixon, Elwatan, Castle Hill (Jerseys) ...	23	3 „
Wollongbar Experiment Farm	112	4 „
St. Michael's Orphanage, Baulkham Hills ...	18	5 „
S. E. E. Cohen, Auburn Vale Road, Inverell...	23	12 „
B. N. Coote, Auburn Vale Road, Inverell ...	53	14 „
F. C. Harcombe, Hillcrest Farm, Warialda Road, Inverell ...	32	15 „
J. De Ville, Inverell ...	10	15 „
A. N. De Fraine, Reservoir Hill, Inverell ...	22	15 „
Emu Plains Prison Farm ...	100	20 „
K. W. D. Humphries, "Karoola," Muswellbrook ...	162	24 „
H. F. White, Bald Blair, Guyra (Aberdeen Angus) ...	137	26 „
Sir F. H. Stewart, Dundas ...	6	30 „
Berry Training Farm, Berry ...	162	31 „
Cowra Experiment Farm ...	41	27 June.
P. M. Burtenshaw, Killean, Inverell ...	31	27 „
A. E. Liggins, "St. Leger Dairy," Kuring-gai Chase Road, Turramurra North ...	52	7 July.
Kahlua Pastoral Co., "Kahlua," Coolac ...	314	10 „
Lunacy Department, Rydalmere Mental Hospital ...	65	30 „
W. J. Frizelle, Rosenstein Dairy, Inverell ...	76	1 Aug.
W. Budden, "Hunter View," Kayuga Road Muswellbrook ...	18	7 „
T. McLane, Wellingrove, Inverell ...	33	10 „
W. Willis, "Rosedale," Inverell ...	17	13 „
E. L. Killen, "Pine Park," Mumbil ...	252	23 „
A. Hannaford, Braidwood ...	20	26 „
W. S. Grant, Braidwood ...	20	26 „
J. McKenzie, Inverell ...	35	28 „
Farrer Memorial Agricultural High School, Nemingha ...	39	29 Aug.
The William Thompson Masonic School, Baulkham Hills ...	50	29 „
Navua Ltd., Grose Wold, via Richmond (Jerseys) ...	118	4 Sept.
Australian Missionary College, Cooranbong ...	113	8 „
Department of Education, Gosford Farm Home ...	40	29 „
A. L. Logue, "Thornbro," Muswellbrook ...	46	13 Oct.
W. C. Wyatt, Sherwood Road, Merrylands ...	32	16 „
Woomargama Estate ...	207	22 „
W. J. Stephenson, "Hill View," Fig Tree ...	57	1 Nov.
Barnardo Farm School, Mowbray Park ...	75	4 „
State Penitentiary, Long Bay ...	10	9 Dec.

Owner and Address.	Number Tested.	Expiry Date.
		1944.
Limond Bros., Morisset...	60	13 Jan.
J. M. Turnbull, "Pastime," Kayuga Road, Muswellbrook...	75	15 „
E. R. Fishlock, Fig Tree, Wollongong ...	38	18 „
St. Ignatius College, Riverview ...	25	27 „
Department of Education, Yanco Agricultural High School ...	69	6 Feb.
Riverina Welfare Farm Yanco ...	74	6 „
St. John's College, Armidale ...	30	8 „
A. C. O'Dea, Perry Street, Dundas ...	28	14 „
McGarvie Smith Animal Health Farm, Liverpool ...	55	22 „
C. Wilton, Bligh Street, Muswellbrook ...	75	3 Mar.
N. L. Forster, Abington, Armidale (Aberdeen Angus) ...	188	12 „
Forster and Sons, Abington, Armidale (Jerseys)	87	13 „
Lunacy Department, Morisset Mental Hospital	84	15 „
Wagga Experiment Farm (Jerseys) ...	81	20 „
Trangie Experiment Farm, Trangie ...	121	20 „
Grafton Experiment Farm ...	191	15 April.
Lunacy Department, Callan Park Mental Hospital ...	26	1 May.
T. J. Wilks, "Oaks Farm," Muswellbrook ...	37	5 June.
New England Experiment Farm, Glen Innes (Jerseys) ...	73	27 „
G. T. Reid, "Narrengullen," Yass ...	274	3 July.
Farm Home for Boys, Mittagong ...	49	9 „
St. Vincent's Boys' Home, Westmead ...	26	20 „
Lidcombe State Hospital and Home ...	106	30 „
Hurlstone Agricultural High School, Glenfield ...	37	31 „
Ehsman Bros., Inverell ...	28	13 Aug.
Peel River Land and Mineral Co., Tamworth (Beef Shorthorns) ...	82	28 „
Fairbridge Farm School, Molong ...	92	31 „
Bathurst Experiment Farm ...	24	9 Oct.
Lunacy Department, Gladesville Mental Hospital ...	34	23 Nov.
Hawkesbury Agricultural College, Richmond (Jerseys) ...	110	18 Dec.
		1945.
The Sydney Church of England Grammar School, Moss Vale ...	51	5 Feb.
Koyong School, Moss Vale ...	2	8 „
New England Girls' Grammar School, Armidale	30	11 „
W. W. Martin, "Narooma," Urana Road, Wagga ...	143	22 „
Lunacy Department, Parramatta Mental Hospital ...	66	30 Mar.
A. E. Stace, Taylor Street, Armidale ...	38	1 April.

Tubercle-free Areas.

The following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis :—

Bombala Area.
Inverell Area.
Braidwood Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

MAX HENRY, Chief of Division of Animal Industry.

Dairy Science Schools, 1943.—Applications Close 31st May.

THE Department of Agriculture intends to hold Dairy Science Schools during the coming winter, but only at centres where there is a guaranteed minimum attendance of ten candidates for that particular school.

Persons wishing to attend these Dairy Science Schools should make written application, accompanied by a fee of 10s. 6d., to the Under-Secretary and Director, Department of Agriculture, Box 36A, G.P.O., Sydney.

The closing date for the receipt of applications is 31st May, 1943. As soon as possible after that date, intending candidates will be advised by the Department as to the centre at which the schools will be held and examinations conducted.

Brucellosis-free Herd Scheme (Swine).

LIST OF ACCREDITED HERDS.

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Adams, J. P., "Melton," Daysdale.
Bathurst Experiment Farm, Bathurst.
Boardman, C., Camden.
Campbell, D., Hillangrove, "Wamberal," via Gosford.
Chapman, G. E. and Son, "Illabo Park," Alectown.
Cocks, F. D., "Condalarra," Gooloogong.
Cowra Experiment Farm, Cowra.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., "Glengar," Capertee.
Farrer Memorial Agricultural High School, Nemingha.
Foley, Mrs. E., Bligh Stud Piggery, Water Lane, Rouse Hill.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Holland, A. L., Argonne, Tubbul.
Hurlstone Agricultural High School, Glenfield.
Maybin, N. C., Towac, Orange.
McCaughey Memorial Agricultural High School, Yanc
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Government Agricultural Training Farm, Scheyville.
Shirley, G. F., "Camelot," Penrith.
Smith, J. M., Eulo Glen, Urana.
Stewart, Sir Frederick, "St. Cloud," Dundas.
Wagga Experiment Farm, Wagga.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., "Gwandalan," Grenfell.
Wilson, A. G., Blytheswood, Exeter.
Wollongbar Experiment Farm, Wollongbar.

Herds Other than Registered Stud Herds.

Bathurst Gaol, Bathurst.
Berry Training Farm, Berry.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Croft, H. M., "Salisbury Court," Uralla.
Glen Innes Prison Camp, Glen Innes.
Gosford Farm Home for Boys, Gosford.
Goulburn Reformatory, Goulburn.
Kenmore Mental Hospital, Kenmore, via Goulburn.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital, Orange.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital, Parramatta.
Peat and Milson Islands Mental Hospital, Hawkesbury River.
Pollak, V., Marata, Harrow Road, Glenfield.
Smith, C. W. J., "Norbiton," Canadian Lead.
Stockton Mental Hospital, Stockton.
Yanco Agricultural High School.

Abortion-free Herds.

THE following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion-free :—

Owner and Address.	Number in herd.	Owner and Address.	Number in herd.
Bathurst Experiment Farm (Ayrshires)	24	Hurlstone Agricultural High School, Glenfield	39
Bauerle, P. A., Holbrook	12	Killen, E. L., "Pine Park," Mumbil	223
Bush, W., Ben Lomond	18	Leitch, J. F., "Tunbridge," Merriwa (Aberdeen-Angus)	72
Callan Park Mental Hospital (Aberdeen Angus)	41	McEachern, H., Tarcutta (Red Poll)	52
Carrick, G., "Clonlea," Central Tilba	37	Martin Bros., "Narooma," Urana-road, Wagga	125
Cowley, L., Redbourneberry, Singleton	56	Navua Ltd., Grose Wold, via Richmond (Jerseys)	122
Cowra Experiment Farm (Ayrshires)	71	New England Experiment Farm, Glen Innes (Jerseys)	97
Department of Education—Farm Home for Boys, Gosford	36	New England University College, Armidale	16
Department of Education—Farm Home for Boys, Mittagong	36	Peel River Land and Mineral Co., Tamworth	82
Dixson, R. C., "Elwatan," Castle Hill	24	Reid, G. T., "Narrangullen," Yass	171
Fairbridge Farm School, Molong	93	Robertson, D. H., Scone	82
Farrer Memorial Agricultural High School, Nemingha	35	Rydalmere Mental Hospital, Rydalmere	57
Forster and Sons, Abington, Armidale (Jerseys)	265	Salway, A. E., Cobargo	95
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	188	Skinner, D. S., "Wyworrie," Ben Lomond	38
Gladesville Mental Hospital	34	Smith, Jas. C., Ben Lomond	83
Grafton Experiment Farm (Aberdeen-Angus)	29	Stewart, Sir Frederick, "St. Cloud Stud," Spurway-street, Dundas	9
Grafton Experiment Farm (Australian Illawarra Shorthorns)	93	Trangie Experiment Farm, Trangie	88
Hann, O., Chatsworth Road, St. Marys	35	Wagga Experiment Farm, Wagga, N.S.W.	45
Hawkesbury Agricultural College, Richmond (Jerseys)	108	Walker, Jas. R., "Strathdoon," Wolseley Park	32
Hicks A. A., Estate, Culcairn	52	White, F. J., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	189
Hill, R. Pritchard, Bowling Alley Pt. (Jerseys)	96	Williams, Chas., Ben Lomond	27
Hordern, E. D., Cabramatta (A.I.S.)	95	Young, A. H., "Rock Lynn," Cudal (Polled Beef Shorthorns)	12

MAX HENRY, Chief of Division of Animal Industry.

The Agricultural Gazette.

June, 1943.

TO STABILISE DAIRY FARMING.

WISE use of the financial assistance to be made available by State and Federal governments should enable dairy farmers to stabilise their industry to an extent never before attained. That will be achieved only if farmers apply to the farming side of their industry the same measure of co-operative effort which has been extended to the manufacturing side.

On top of the Commonwealth's subsidy of several millions a year comes the announcement by the New South Wales Premier (Mr. McKell) that £100,000 free of interest, will be made available to dairy farmers in this State for the purpose of acquiring farming plant, either for operation on a collective basis, or for hiring out to individual farmers. The money will be made available to dairy factories working in close co-operation with War Agricultural Committees. In other words, the scheme will be locally implemented by practical men, who will estimate local requirements, fix hiring rates and conditions, and generally supervise operations.

The State Government will accept liability for the whole of the advance approved for each factory, which will be safeguarded against loss up to the total amount of the fund allotted. This amount will be sufficient to meet the original cost of a reasonable working unit, and, in addition, will provide a wide margin to cover initial working expenses.

When the fund created for the factory is liquidated the plant will be owned by it free of any liability. Moreover, if the factory finds that, after the scheme has been operating for a period, the receipts, together with sale value of plant, still leave a debit balance, this debt will be waived by the Government up to the limit of the original fund made available.

The terms of the advance are extremely liberal, but, as the Premier announced, the Government felt justified in taking this unusual step to speed up dairy production at all costs.

Lack of finance has always been advanced as the reason for so much dependence on seasonal factors and too little reliance on farming in our dairying industry, but finance will not automatically remove such present-day obstacles to production as non-availability of machines, spare parts and facilities for maintenance of working plant. These factors have not been overlooked in the Premier's scheme, for he has promised to take them up immediately with the

authorities concerned. Even when these matters have been righted there remains one factor vital to the successful functioning of the scheme--the whole-hearted co-operation of dairy farmers with the local management committees.

Cost Plus as it Affects the Farmer.

"UNTIL the spirit and letter of the Atlantic Charter are applied, I am afraid there are certain to be surpluses of some agricultural commodities. . . . To rid the world of these surpluses by freeing the channels of distribution will require great statesmanship and a change in international spirit, and also a supreme effort of salesmanship on the part of the producers themselves." This combined warning and invitation was contained in an address by Dr. A. R. Callaghan at the annual meeting of the Council of the Victorian Chamber of Agriculture.

Dr. Callaghan, Principal of the Roseworthy Agricultural College, South Australia, was appointed last year Assistant Director (Rural Industries) of the Department of War Organisation of Industry. It is his function to survey agricultural problems in their international as well as their national setting.

He questioned the applicability of a "cost-plus" system to farm produce. The system served in secondary industries, he said, to start production of war-time necessities which were wanted in unlimited quantities. There was all the difference in the world, however, between production by a single factory of large quantities of some secondary commodity, and the production of a primary commodity by innumerable farm units under highly variable conditions. The system of "cost-plus" reduced the incentive to economy and efficiency, which were the very things the primary industries needed most. Farmers had to fall back on average costs; it was impossible to guarantee profits for every farmer for any long period irrespective of his costs. To do so would encourage gross inefficiency and over-production. It was possible, nevertheless, to stimulate or depress production by fixing prices—but fixed prices must mean profits for some farmers and losses for others. Actually, the demand for "cost-plus" was a "snappy" way of admitting that production and prices could not be left in the guilty hands of supply and demand. The fate of marginal wheat growers, marginal apple growers, marginal dairymen and other uneconomic producers depended on the level of price fixation.

The centre of the problem, continued Dr. Callaghan, was that satisfactory prices encouraged production beyond demand, with consequent embarrassing surpluses. Some control over production was therefore the corollary of stabilised remunerative prices—at any rate, until the channels of world trade flowed more freely. Dr. Callaghan concluded by saying that rural producers must organise and act unitedly if they wanted payable prices and were not getting them—but this would mean controlled production.

Green Manuring the Farm Garden.

IF animal manure in quantity is not available, the growth of green manure crops for digging under becomes part of an efficient system of management of garden soils. Green manures serve the purpose of conserving the mineral matter of the soil, increasing the amount of combined nitrogen, and counterbalance the continuous diminution in organic matter due to bacterial action. The more immature the green crop and the lighter textured and better aerated the soil, the more rapidly is the material decomposed. The period that elapses between the digging under of the green crop and the planting of a new crop should not be so great that the nutrients, which are rapidly liberated once decomposition begins in the soil, are lost. In gardening practice where sandy or heavy soils require organic matter in quantity for the improvement of their texture, the practice of green manuring alone is insufficient to ensure this effect, though its value in providing rapidly available nutrients is considerable.

Rate of Nitrogen Release.

Succulence and the nitrogen content of green manures determine the rate of release in usable form of nitrogen from its compounds present in the growing plant. Fibrous legumes, or legumes poor in nitrogen as occur when grown on poor acid soils lacking the appropriate organisms for nodule production, may deplete the soil of nitrogen suitable to plant nutrition for several weeks or months. When legumes of correct maturity and nitrogen content are turned under, an ample release of nitrogen may be in evidence in moist soil in two weeks' time. Where favourable results are to be expected of green manure crops, nitrogenous fertilisers should be applied to non-legumes, and ample minerals, a favourable degee of acidity and the correct organisms for inoculating must be provided for legumes.

Sow in Winter.

With the enthusiasm of spring, most of the space is utilised in the majority of gardens, but any areas which are not used in autumn or winter can be put under a green crop. A hardy and useful crop for the garden is a mixture of wheat and vetches, broadcast with superphosphate over the prepared ground, and then raked in or turned under to a depth of 1 or 2 inches with a spade, taking a shallow horizontal slice and inverting. Other quick-growing and useful crops are New Zealand blue lupins, field peas and tick beans, which may be grown alone or mixed with a cereal. The rapidity of growth of these crops, under good conditions, makes them useful for growing in the interval between crops.—N. H. PARBERY, Analyst.

"Diploma Day" at Hawkesbury Agricultural College.

Minister Presents Prizes.

THE work of Hawkesbury Agricultural College was well known to and appreciated by the primary producers of the State, said Hon. W. F. Dunn, M.L.A., Minister for Agriculture, when welcoming parents of students and visitors to "Diploma Day"—the occasion of the annual presentation of prizes—at Hawkesbury Agricultural College, on 5th May.

He was, however, anxious that the services provided by the Department of Agriculture and the College should become widely known and appreciated by the whole of the people of the State.

Agriculture was the "life of the people," he said, for the soil produced everything that we needed for food and clothing. It was vital to the nation's welfare that our soils, together with our water supplies and our timber resources, should be preserved. We were only trustees of these things, and it was our duty to hand them down unimpaired in usefulness. In the past we had not always used them well, and a halt must be called to such methods. The responsibility for this rested not only on the Department, but on all sections of the community.

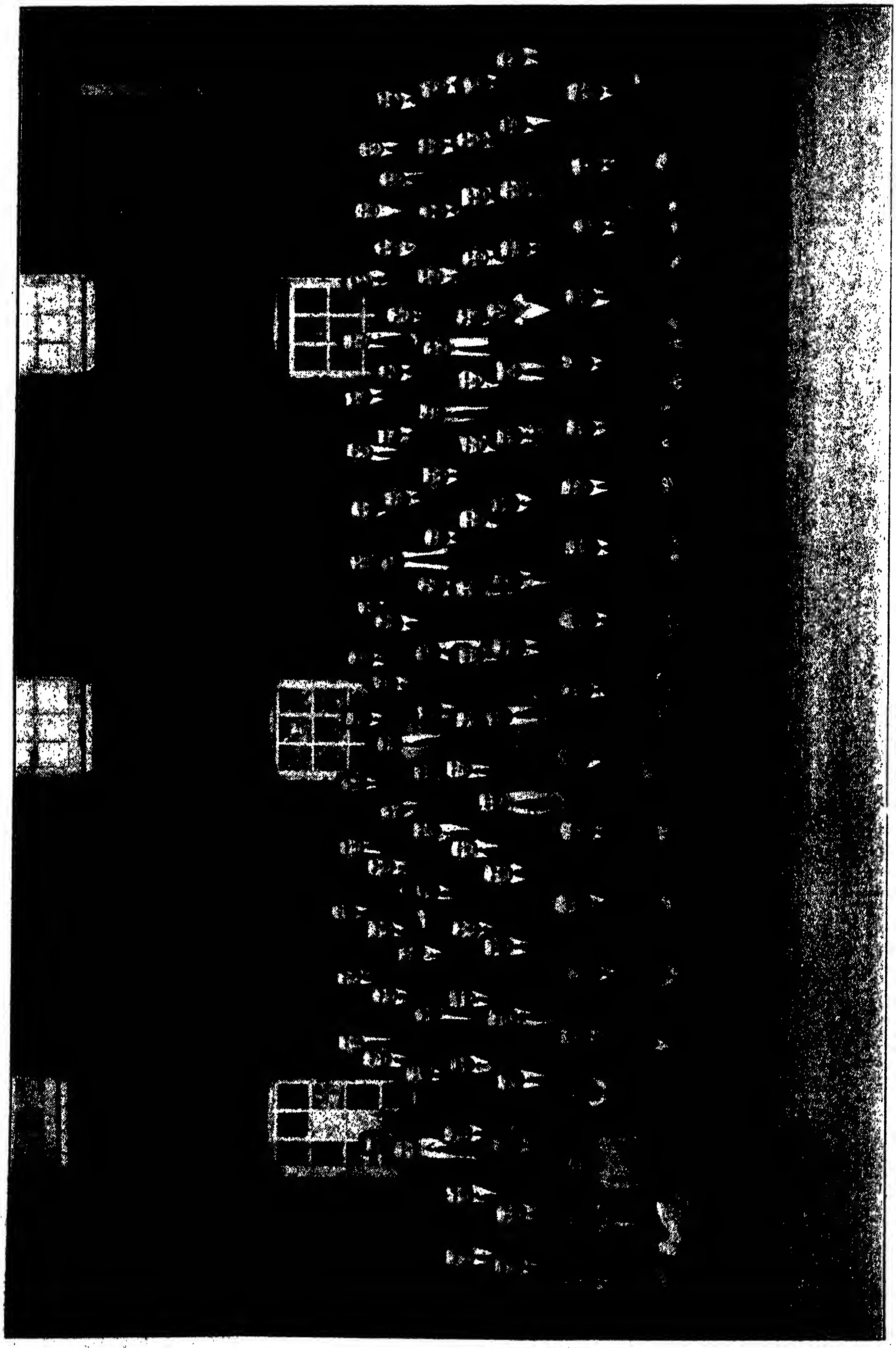
Hawkesbury College provided training in all classes of farming—and farming to-day was a highly skilled occupation. Present-day farmers appreciated the work of departmental officers trained at the College, and these men were out to assist farmers in every way possible. Mr. Dunn invited producers to make the fullest possible use of the Department and the College.

When a young man completed his training at Hawkesbury Agricultural College he was well equipped to start off in life in one or other of the many avenues open to those who purposed working in the primary industries or allied occupations. Mr. Dunn extended his best wishes to the students for the difficult days ahead of them.

The Principal's Report.

In his annual report, Mr. E. A. Southee indicated that for the year 1942 seventeen diplomas in agriculture and seven diplomas in dairying were awarded. The

Picturesque Hawkesbury College Buildings.



Staff and Students at Hawkesbury Agricultural College Diploma Day.

With the Principal (Mr. E. A. Southee) are Hon. W. F. Dunn, M.L.A., Minister for Agriculture (who presented the prizes), Dr. R. J. Noble, Under-Secretary for Agriculture, and Mr. E. F. Whitbread, Assistant Under-Secretary.

Principal's gold medal for Dux of the College was won by J. M. Logan, of Bunnan.

Owing to the paucity of applications, due to military requirements and other national calls on those otherwise eligible to apply, and in view of the general war position, it was decided to suspend the course for the Diploma in Dairying for the duration of the war.

DURING the Diploma Day proceedings at Hawkesbury Agricultural College, the Minister for Agriculture (Hon. W. F. Dunn, M.L.A.), congratulated the Principal (Mr. E. A. Southee) on having held office for a longer period than any of his predecessors. Mr. Southee was appointed Principal in February, 1921, and has thus occupied his present position for more than twenty-two years. "He has rendered a service of great value, not only to the College, but to agriculture throughout Australia," said Mr. Dunn. "Many of Mr. Southee's students are officers of our own Department and of the Departments of Agriculture in other States."

Items of special interest from the report are as follows:—

For 1943, the Director-General of Manpower decided that all students in residence were to complete their respective years, and that First and Second Year students over 18 years of age would be permitted to enter succeeding Second and Third Years respectively if their records were above class average.

"We have made available accommodation and facilities for the training of 'Hostel Matrons' for the Women's Land Army—already three groups have undergone the course.

"The College also undertook the responsibility of growing a considerable area of vegetables at the River Farm, under contract with the Commonwealth Government.

"In February, 1943, in conformity with Departmental policy in making available to farmers, stud animals of proven quality, at reasonable prices, some fifty high producing cows and quality sires from the College Jersey stud were disposed of at auction—the first cattle sale of its kind held at the College. The sale was highly successful and attracted buyers from Queensland and Victoria, as well as from all parts of New South Wales.

"The records of the Old Boys' Union show that the proportion of ex-students following up the training received at the College is approximately 80 per cent.

"It is very gratifying to be able to report that the Senate of the University of Sydney has graciously agreed to extend to 1st January, 1947, the matriculation concession granted to the College, whereby holders of the Intermediate Certificate in specified subjects and the College Diploma in Agriculture (H.D.A.) with honours, are accepted as matriculated students in the Faculties of Agriculture and Veterinary Science.

"The uncertainty with regard to the admission of ex-students to the Teachers' College has been removed by advice received from the Director of Education that 'when suitable Diplomates with Honors are available their applications for entrance to the Teachers' College will be considered in conjunction with those applicants with the Leaving Certificate, who have completed an agricultural course at a post-primary school.'

"PRIMARY producers are in No. 1 civilian job, and should rank next to the fighting men. Young men trained in production can do a better job in that field than if drafted into the Services which may not use their abilities to the best advantage of the nation."—F. J. Finnan, M.L.A., when speaking at Diploma Day at Hawkesbury Agricultural College.

"A scholarship, available for award to dairy produce factory employees eligible for admission to the Second Year of the Dairying Diploma Course and valued at £80 per annum was founded by representative dairy industry organisations to commemorate the memory of the late Mr. C. E. D. Meares.

"A scholarship, valued at £40 per annum, tenable in the course for the Diploma in Agriculture, has been provided by *The Land* Newspaper and the Farmers and Settlers' Association as a memorial to the late Sir Arthur King Trethowan, M.L.C."

Seed Impurities of *Phalaris tuberosa.*

Commoner Species Described.

AMY MYERS, Seeds Officer.

NEW South Wales Government-certified *Phalaris tuberosa* is guaranteed to be true to name, to conform to the purity and germination standards of the Agricultural Seeds Act, and to be free from *Phalaris minor* (Annual Canary grass). In some years uncertified seed of this species is on the market, and while it may not be of such high quality as the certified material, it must comply with the provisions of the Act. Farmers should make themselves familiar with the seed impurities that occur in all samples in order to guard against their introduction to their properties. The purpose of this article is to describe and illustrate these impurities.

In the following descriptions, the names of totally prohibited seeds (those in Schedule A of the Agricultural Seeds Act) are printed in **black** letters; those in SMALL CAPITALS are limited by Schedule C to certain numbers per ounce.

Some of the most commonly found impurities have already been described in an article on seed impurities of lucerne (see *Agricultural Gazette,* September, 1941). These are PIGWEED or REDROOT, FAT HEN, SHEEP SORREL, CURLED DOCK, WIRE WEED, **Saucy Jack** and **Spear Thistle,** the last two being noxious weeds.

The seeds are described as they appear to the naked eye or under a hand magnifying glass. As few technical terms as possible are used, but so many grass seeds are found in *Phalaris* that an outline of their structure may be useful. The grass seed consists of husk and grain, with a short stalk (the rachilla), pressed against the husk. Often there is present a bristle or hair-like appendage known as an awn, attached to the back or tip of the husk.

Seed of *Phalaris tuberosa.*

The seeds are listed under the families in which they are classified botanically, and the latter are arranged in a commonly accepted sequence.

GRAMINEAE.

Kentucky Bluegrass (*Poa pratensis* L.).—About one-twelfth inch long, straw to brown in colour, three sided, face narrowly grooved for about three-quarters of its length; rachilla prominent, cylindrical and knobbed; naked seed slightly smaller, smooth, tan to brown, three sided and grooved on one side.

Italian Ryegrass (*Lolium perenne* L.).—About one-fifth to one-quarter inch long without the awn, straw to grey in colour, lower portion darkened by the enclosed grain. Outer surface slightly convex and marked with one or more inconspicuous nerves; inner face grooved for about three-quarters of its length; at the base is the rachilla, flat and wedge-shaped; awned from the back, but the awn is usually broken during cleaning processes and the seed occurs with the awn missing and the tip of the seed broken.

Perennial Ryegrass (*Lolium perenne* L.).—Usually shorter than Italian ryegrass but otherwise very similar. Without a microscope the identification of the seeds is usually impossible. Naked seeds of both species often occur. They are approximately one-eighth inch long, almost oblong in shape, light brown to nearly black, face with a shallow central groove.

A Bent Grass or Reed Grass (*Calamagrostis filiformis* Pilger).—About one-twentieth inch long, with an awn of about the same length; silver to grey in colour; covered with fine silky hairs. Sometimes found in a husk of two straw-coloured papery glumes, attached to a short stalk.

Annual Canary Grass (*Phalaris minor* Retz).—*Phalaris tuberosa* seed containing *P. minor* is not eligible for certification in New South Wales, as the latter is an annual and of much less agrostological value.

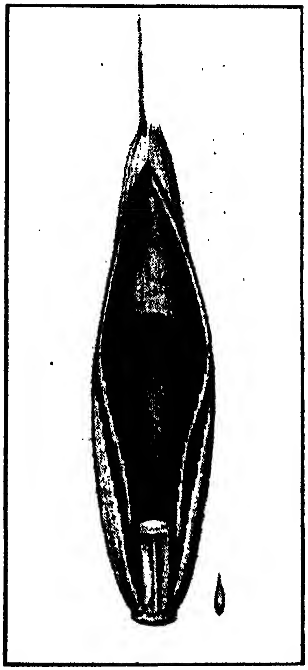
It is very similar in appearance to *P. tuberosa* but is smaller, and tapers more abruptly to an acute tip. About one-ninth inch long, dark greyish-brown, smooth and shining; upper portion covered with long, silky hairs; both sides with one or more light-coloured longitudinal lines.

Though shape and size differ from *P. tuberosa,* the differences are slight, but there are two characters by which identification can be made with certainty. These are:—

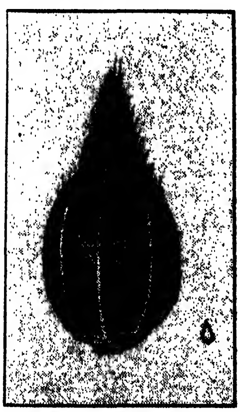
1. At the base of *P. minor* on one side is a sterile floret held by a small scale; on the other, a small scale only. At the base of *P. tuberosa,* on each side, are a sterile floret and scale.

2. The florets are sometimes broken off during cleaning, but the remaining character is infallible if the seed is capable of germinating. The root

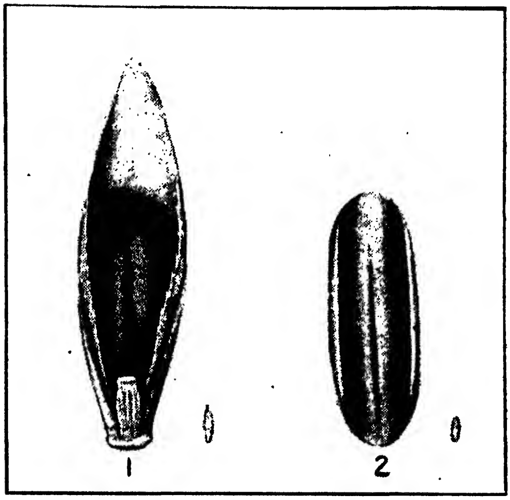
Kentucky Blue Grass.
(*Poa pratensis.*)



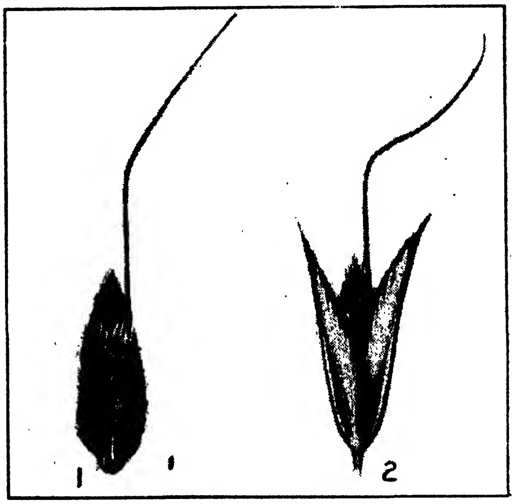
Italian Rye Grass.
(*Lolium multiflorum.*)



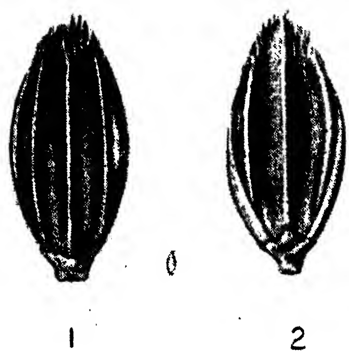
Annual Canary Grass.
(*Phalaris minor.*)



Perennial Rye Grass.
(*Lolium perenne.*)



A Bent or Reed Grass.
(*Calamagostis filiformis.*)



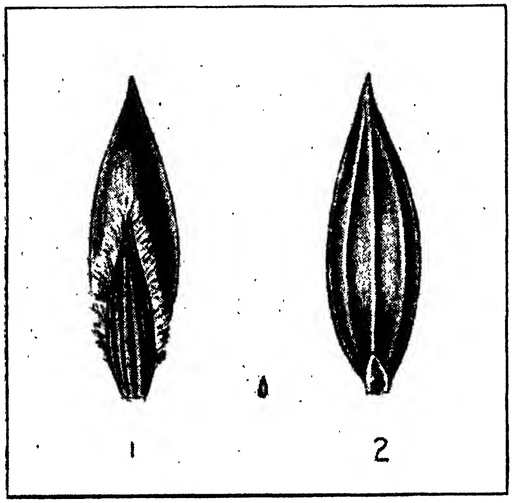
Water Grass.
(*Brachiaria* sp.)

of *P. minor* is pink with red root-tip. The root of *P. tuberosa* is white. To test for root colour, that is to make a germination test, place the seeds on a moist (not wet) pad of cloth or blotting paper, in a room where day temperature is not higher than 90 deg. Fahr. and night temperature not lower than 60 deg. Fahr. Germination occurs in six days or so.

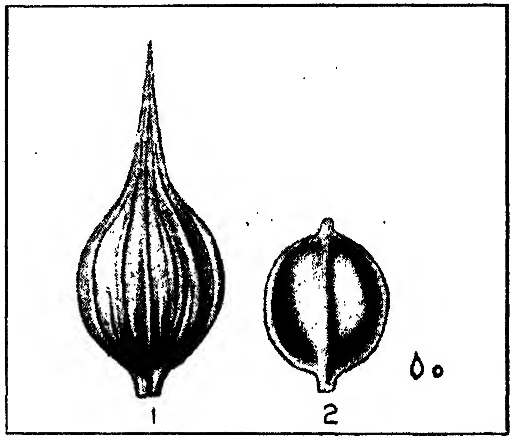
Water Grass (*Brachiaria* sp.).—About one-ninth inch long, pale-green to straw in colour; outer side convex, marked with two or more veins, two smooth, dull surface partly covered by a hairy scale; inner side flat, with three well-defined parallel veins; small scale at base.

CYPERACEAE.

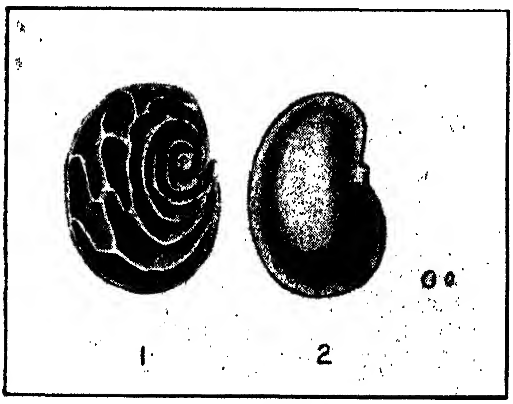
A SEDGE (*Carex* sp.).—The seed characters in many species of the sedges are very similar. That which occurs most commonly in *Phalaris* samples is contained in a brown husk, tapering to a long point at one end and with a short, blunt "stalk" at the other; about one-twelfth to one-tenth inch



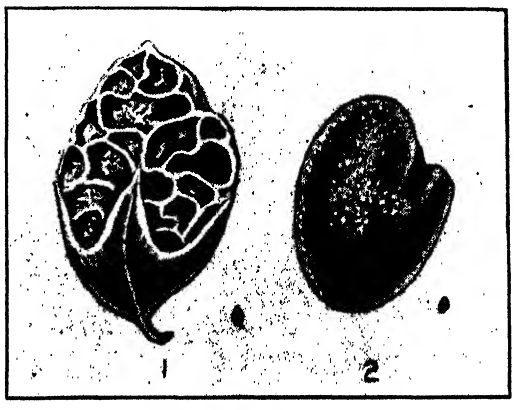
Summer Grass.
(*Digitaria sanguinalis.*)



A Sedge.
(*Carex* sp.)



Black Medick.
(*Medicago lupulina.*)



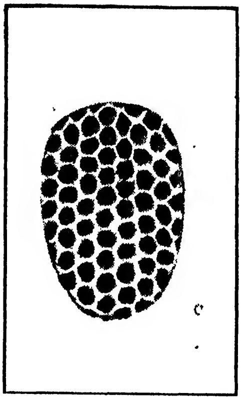
Hexham Scent.
(*Melilotus indica.*)

small scales at the base; inner surface flat, with three prominent veins, one small scale at the base; both sides are sparsely covered with hairs which make a short fringe at the tip of the seed; rarely found without the husk, the naked seed has a faintly granular surface; convex side folds over the inner flat side.

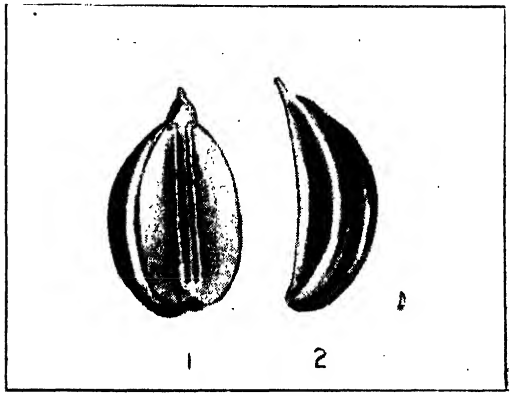
SUMMER GRASS (*Digitaria sanguinalis* L.).—About one-tenth inch long, narrow, sometimes outlined by short, woolly hairs, greyish-green to fawn in colour; slightly convex on one side, with long, slightly convex on one side, flattened on the other, veined. The seed is smooth, shining, brown, rounded in outline, with beak at one end and "stalk" at the other; occasionally is found with prominent central ridge that makes the seed nearly three-sided.

LEGUMINOSAE.

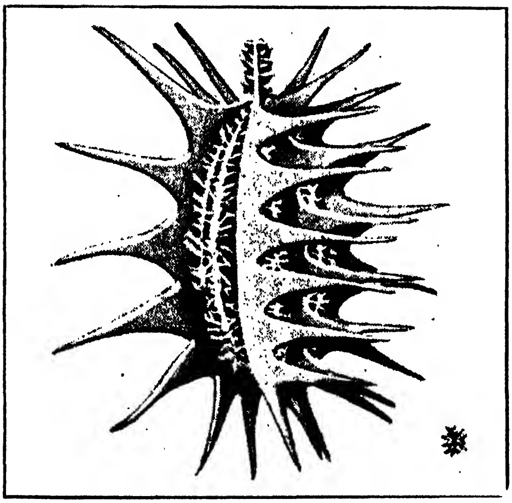
Black Medick (*Medicago lupulina* L.).—Seed is enclosed in a rounded black pod about one-twelfth inch long; surface covered with a network



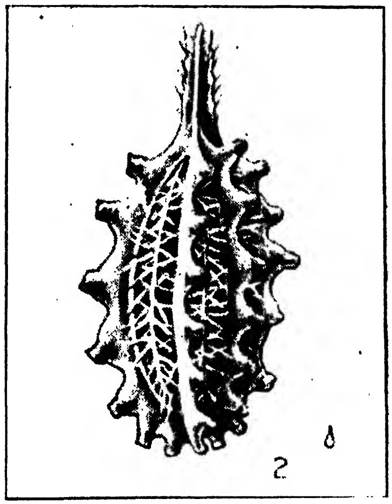
Cut-leaved Cranesbill.
(*Geranium dissectum.*)



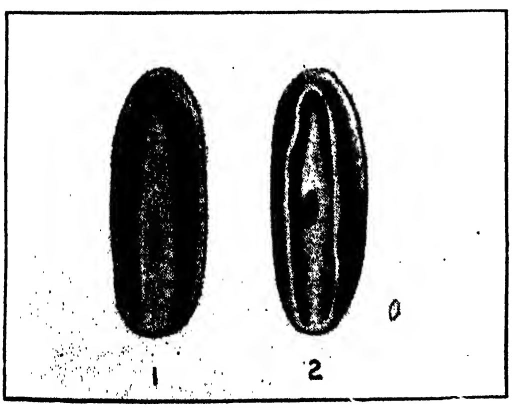
Wild Parsley.
(*Apium leptophyllum.*)



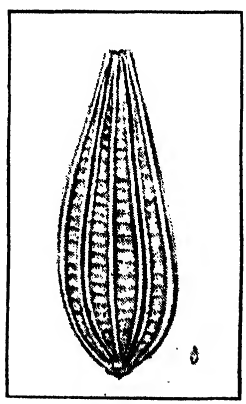
Dwarf Carrot.
(*Daucus brachiatus.*)



Dwarf Carrot.
(*Daucus brachiatus.*)
Seed as seen in dressed samples.



Rib Grass.
(*Plantago lanceolata.*)



Sow Thistle.
(*Sonchus oleraceus.*)

of veins. There is one seed to each pod, rounded to kidney shape, with a small projection in the middle of the kidney; greenish-yellow to yellow-brown; surface smooth.

Hexham Scent (*Melilotus indica* All.).—A totally prohibited impurity of agricultural seed. About one-fifteenth to one-tenth inch long, nearly oval to rounded in outline, surface dull and covered with minute tubercles; greenish-grey to yellow-brown in colour. Old seeds are dark brown. Sometimes found enclosed in rough, papery, veined husk, with or without a five-lobed calyx, which resembles five small petals united to a stalk.

GERANIACEAE.

Cut-leaved Cranesbill (*Geranium dissectum* L.).—About one-fifteenth to one-twelfth inch long, almost oblong in outline, grey or red-brown to nearly black in colour, surface dull, covered with a fine network. Very often the seed is pinched, which gives the effect of a three-sided seed with one side rounded and the other two meeting in a ridge. An inconspicuous scar of attachment occurs on one side of the base.

UMBELLIFERAE.

Wild Parsley (*Apium leptophyllum* L.).—About one-twentieth to one-fifteenth inch long; sometimes occurs in pairs; straw to grey in colour, inner face slightly concave and marked by a dark, recessed central line running from tip to base; outer side convex and divided into five conspicuous, rounded ridges, though only three of these are seen when the seed is lying on the inner face; surface smooth and dull, occasionally darker between the ridges.

Dwarf Carrot (*Daucus brachiatus* L.).—About one-eighth inch long, bottle-shaped with a comparatively long "neck," straw to light brown in colour; inner surface concave, marked with a central ridge, margins bear a row of short, white bristles; back convex, with four longitudinal rows of strong spines alternating with three rows bearing short white bristles. The seed may be so damaged during cleaning that spines are completely broken and the seed merely bears a roughened surface.

PLANTAGINACEAE.

Ribgrass (*Plantago lanceolata* L.).—About one-twelfth to one-seventh inch long, almost oblong in shape, light brown to nearly black, surface smooth, shining. The lighter coloured seeds are almost translucent, the darker ones opaque. Outer side convex and curving over the inner surface, which bears a deep central, longitudinal groove; occasionally a papery remnant of the husk adheres to the inner face and conceals this groove. Seeds are sometimes found in pairs with only the convex outer faces visible.

COMPOSITAE.

Cat's Ear (*Hypochaeris radicata* L.).—About one-sixth inch long, so narrow as to look like a piece of stick, light brown to nearly black, surface dull, rough and ribbed longitudinally; sometimes bears a cream-coloured pappus on a long stalk.

Sow Thistle (*Sonchus oleraceus* L.).—About one-ninth inch long, flattened, tapering slightly to a blunt tip, light brown in colour, margined; a narrow groove on each side of a central rib, surface dull, transversely wrinkled. Rarely found with the pappus attached; pappus white, stalkless and cottonlike.

Ergotised Heads.

ERGOT (*Claviceps purpurea* (Fr.) Tul.).—Ergot is a common fungus disease of grasses which prevents the formation of seeds. Occasionally one finds ergots held in the glumes, as the grain normally would be, but more often the pieces of ergot are lying loose in the seed samples.

Ergots of *Phalaris tuberosa* are nearly the same size and shape as the *Phalaris* grain, but are black or purplish black and with a somewhat rough dull surface, instead of being brown and smooth as are the grains.

Ergots of ryegrass are larger, oblong in shape, black or purple-black in colour, superficially similar to ryegrass grain, but usually lacking the characteristic shallow groove.

Though the disease is common, its incidence varies with seasonal conditions, and not many ergots are found in any one sample.

Saccharine Unsatisfactory Substitute for Sugar in Jams.

REQUESTS reach this Department from time to time for jam-making recipes, using saccharine instead of sugar. Sugarless jams are demanded by diabetics and people affected by gastric and similar ailments.

A jam manufacturer has advised us that saccharine has not been successfully used as a substitute for sugar in jam making. Glycerine, however, has been used as a sweetening agent in jams, canned fruits, tomato sauce and pickles. Details of these trade recipes are, of course, not available to the public. Furthermore, glycerine is not likely to be procurable on the open market while the war lasts. It is understood that quantities of glycerine will be released shortly to jam manufacturers to enable them to supply sugarless products to diabetics.

The following recipes for a sugarless marmalade made with a basis of gelatine, is extracted from "The Diabetic Life—Its Control by Diet and Insulin," by R. D. Lawrence.

Marmalade.

Lemons	1½
Peel of orange	1 large
Saccharine	5 grains
Water	7 oz.
Leaf gelatine	¼ oz.

Wash orange and lemons; finely shave the skin of lemons and orange (avoiding white pith) and chop; add juice and pulp of lemons. Put into a saucepan and cover with the water. Bring to boiling point and simmer for 2 hours, adding water when necessary to keep to stated amount. Cut gelatine into fine strips; add it with saccharine to mixture, and stir for 10 minutes. Put into a jar and leave to set.

This marmalade will keep only for a short time and its food value is negligible.

Approved Seed—June, 1943.

To assist in the production and distribution of approved seed of recommended varieties of crops and vegetables, the Department publishes in this list each month the names and addresses of growers of such seed. For this service a charge of 2s. 6d. is made for each insertion of each variety listed. The number of varieties listed on behalf of each grower will be restricted to twenty-five for the time being. The Department may inspect the crop producing the seed, and in all cases a sample of the seed must be sent to the Department of Agriculture with information as to the location of its production, and must be accompanied by the fee indicated above.

If any seed producer does not wish to pay the advertising charge he may submit his name with the variety of seed and sample to the Department, and if it is approved his name will be listed in the Department and information will be supplied regarding it to inquirers.

Tomatoes—

Red Marhio No. 95—Rumseys Seeds Pty. Ltd., 331 Church-street, Parramatta.

Vetemold—Rumseys Pty. Ltd., 331 Church-street, Parramatta.

Potentate—Rumseys Pty. Ltd., 331 Church-street, Parramatta.

Cauliflower—

Shorts—H. Burton Bradley, Sherwood Farm, Moorland.

French Beans—

Brown Beauty—Mr. H. P. Pichards, "Sovereington," Tenterfield.

Granda—Mr. H. P. Richards, "Sovereignton," Tenterfield.

Varieties of Approved Seed Available.

IN order that farmers may be directed to what are regarded by the Department as the most satisfactory local sources of approved seed of recommended commercial varieties of farm crops and vegetables, the Department is willing to supply information concerning such sources of seed of the following varieties:—

Grasses, etc.—

Phalaris tuberosa, Subterranean Clover (mid-season), Sheep's Burnet, Lucerne, Sudan.

Wild Rose Berries—Latest Health Food.

OVER the Australian countryside, an important health food is growing wild. It is the berry which forms on the wild briar rose bush after the rose itself has blossomed and fallen. It can be had for the picking, its preparation is as simple as stewing a pot of fruit and it is pleasant to the taste.

Beleaguered Britain was the first to exploit the value of wild rose berries (known to scientists as hip berries) on a large scale. Last year, huge quantities were gathered and used for the preparation of purees, syrups and jams to provide an additional source of vitamin C — the all-important vitamin which prevents scurvy, loss of appetite, anaemia, loss of weight and low resistance against infection. Experiments have been conducted at the Institute of Anatomy, Canberra. and results obtained show that puree prepared from cooked, mature hip berries, is rich in this the protective vitamin C.

In country districts where wild rose bushes grow, harvesting of berries now for the preparation of syrup and jams will ensure that a store of vitamin C will be available when other sources of this vitamin — potatoes, tomatoes, turnips, swedes, greens, citrus and tropical fruits such as pawpaws and pineapples—are in short supply.

When gathering rose hips, remember that the mature berry is bright scarlet, as distinct from the deeper red of the over-ripe or the orange of the immature hips. Be sure to wear gloves and use scissors.

If the country housewife has gathered a few basketsful of mature berries, this is what the nutrition experts of the Commonwealth Department of Health advise her to do:

To Make Rose Hip Puree.—Take 2 lb. of rose hips and 2 pints of water. Remove the stalk and the remnants of the rose from the end of the berries and stew them in an aluminium or enamel saucepan until tender. This will take about twenty minutes and the lid should be kept on the saucepan. Then press the mixture through a sieve and the result will be a brownish-tinted puree of about the same consistency and thickness as jam.

This puree is the basis for the two recipes that follow:

Rose Hip Honey.—Take 2 pints of puree and 1 lb. of sugar. Boil together until a skin forms on the surface of a test sample poured on to a cold plate. Pour into hot, sterilised jars and seal immediately. Store in a cool, dark place. This honey can be spread on bread and butter in the same way as jam. It has a pleasant, distinctive flavour which combines some of the taste of peach jam with some of the taste of tomatoes.

One serving of rose hip honey (one-half a tablespoonful) has been found to contain 40 milligrammes of vitamin C (ascorbic acid), which is a full day's requirements for a child and two-thirds of the quantity necessary for an adult.

Rose Hip Soup.—Add one part of puree to three parts of any good vegetable soup. The result is a soup that has a flavour not unlike tomatoes. An average serving yields enough vitamin C for a child's daily requirements.

Housewives interested in this new and important health food are invited to write to the Director, Institute of Anatomy, Canberra, for literature.—*Issued by the Nutritional Advisory Council of the Department of Information.*

PARAGRAPHS AND NOTICES.

Liverseed Grass of Limited Utility.

THE districts in New South Wales in which liverseed grass (*Urochloa panicoides*) is worth trying are the areas of self-mulching soils of the North-western and Central-western Slopes and better rainfall portions of the Plains. There, and particularly on the friable black soil plain country, liverseed grass may be a useful additional species to other summer rainfall requirers, namely, Mitchell, Flinders, panic and star grasses. Being a summer-growing annual, this species must have sufficient rain during the warmer months, and also a friable surface soil in which the seed dropped the previous year will readily germinate during its next growth period. The summer rainfall must also be ample to maintain sufficient growth for stock, and to enable a supply of seed to form in order that the grass will re-establish itself in the pasture during the following spring or summer season.

Farmers and graziers who are desirous of trying this species out on their country should purchase only a small quantity of seed and sow it during the warmer spring months.

Unsuitable Conditions.

It would be wasting money to purchase seed for the following conditions:—

(1) Areas in which the summer rainfall is particularly low, such as parts of the South-west and Riverina.

(2) Coastal country, as there greater growth would be obtained from summer growing perennials such as paspalum, kikuyu and Rhodes. As an annual crop plant Japanese millet would produce a far greater bulk of feed and be less expensive to sow, as seed of this summer-growing fodder only costs 3d. to 4d. per lb., whereas liverseed grass is being retailed at 4s. per lb. The rate of seeding will be the same, viz., 8 lb. per acre; seed samples of this grass tested in the Department's seed laboratory have germinated in the vicinity of 40 per cent., whereas Japanese millet averages 80 per cent.

(3) Districts with long cold winter and spring periods, *e.g.*, parts of the Tablelands.

(4) Under irrigation. Liverseed grass, if grown as an annual crop, would be considerably inferior to Japanese millet or Sudan grass in bulk of feed produced, and as a pasture would compare unfavourably in yield and length of growing season with paspalum (*Paspalum dilatatum*).—J. N. WHITTET, Chief Agrostologist.

Need for Care in Grading Citrus.

THE Minister for Agriculture and Forests, Mr. Dunn, draws the attention of citrus growers and packers to the necessity for more careful observance of the regulations relating to the grading of citrus fruit, more particularly as regards the dryness or immaturity of oranges.

Dryness in relation to an orange, it is pointed out, may be defined roughly as having a juice content of less than 33 per cent. of the total weight of the orange. An orange is declared to be immature when the quantity of N/10 soda required to neutralise 10 cubic centimetres of the juice exceeds 24 cubic centimetres for a navel orange or 30 cubic centimetres for any other type of orange. In the case of White Siletta oranges the only maturity requirement is that the fruit shall have naturally reached an orange colour. Further information regarding the grading of citrus fruit may be obtained from local fruit instructors and inspectors or on application to the Under Secretary and Director, Department of Agriculture, Box 36A, G.P.O., Sydney.

As inspectors have been instructed that these provisions are to be strictly enforced, growers and packers should exercise care to ensure their observance. The artificial colouring of oranges cannot be regarded as a substitute for compliance with the requirements of the regulations.

Burning-off Operations—Minister Grants Exemption from Clause 8.

THE Chief Secretary, Mr. Baddeley, draws attention to the fact that under the terms of a notification published in the *Government Gazette* it will now be permissible for burning-off operations to be carried out without permit from local councils up to 31st August, 1943, in all of those portions of the Eastern and Central Divisions of the State of New South Wales as defined in the New South Wales Crown Lands Consolidation Act, 1913, to which the Bush and Rural Fires Prevention Order applies.

"Actually," states the Minister, "the provisions of clause 8 of the order apply during the months of March, April, May, June, July, August, September and October in each year, and require landholders during this period to obtain a permit from council before burning-off may be carried out. However, in view of recommendations made to me by the Bush Fires Advisory Committee, I have granted exemption from this clause to the extent that up till 31st August next it will not be necessary for a person who desires to burn off to first obtain a permit from the local council."

It is particularly emphasised, however, that although until 31st August next burning-off may be conducted in the areas referred to in the notification without permit from local councils, the provisions of clause 10 of the order still apply and the required notices, etc., must be given in accordance therewith.

Farm Tenancy in New South Wales.

The Agricultural Holdings Act, 1941, and its Application.

(*Continued from page* 211.)

An Explanation of the Act.

A. W. S. MOODIE, H.D.A., H.D.D., Senior Agrostologist.

THE Agricultural Holdings Act, 1941, has been designed on lines similar to the Agricultural Holdings Act, 1923 (England and Wales), which is generally acknowledged to be an outstanding piece of legislation of its kind. If tenants and share-farmers take advantage of the benefits it confers, they should have little cause for complaint as to their situation regarding security of tenure and the standard of husbandry they are permitted to follow. In order that the Act may fulfil the functions for which it was designed, it is essential that landlords and tenants be familiar with its provisions.

The major principles embodied in the Act are:—

(1) Tenant farmers and share-farmers are given rights to compensation:—

- (*a*) For certain classes of improvements listed in the First Schedule to the Act, which is reproduced in this section of this article.
- (*b*) For hay, silage, straw, roots, manure and compost stored on the holding at the termination of the tenancy.
- (*c*) For the increased value of the holding which may result from the tenant adopting a standard of farming higher than that required by his contract of tenancy.
- (*d*) For disturbance of tenure except on account of his failure to comply with certain obligations.

(2) The landlord is given the right to compensation for any deterioration in the value of his holding, which results from the failure on the part of the tenant to cultivate the holding according to the rules of good husbandry.

(3) Tenancies of agricultural land are to be for a minimum period of two years, subject to termination only on twelve months' notice, except for certain reasons where shorter notice may be given.

(4) Provision has been made for reviewing and determining at certain intervals the amount of rent to be paid for a holding.

(5) Tenants and share-farmers are given the right to remove fixtures and buildings affixed or erected by them, without obligation to do so, and for which compensation is not payable.

(6) Provision is made for the constitution of agricultural committees to arbitrate on disputes arising under the Act between landlords and tenants and share-farmers.

(7) Any contract or agreement by which a tenant's rights under this Act are taken away or limited is void.

PART I.—PRELIMINARY.

The Act repeals the Rural Tenants Improvements Act, 1916, and the Agricultural Lessees Relief Act, 1931, but any rights or obligations incurred under either of these Acts are not affected. Any proceedings already commenced under these Acts may be continued as if the Agricultural Holdings Act, 1941, had not been passed.

Definitions (Section 4).

Definitions essential to a complete understanding of the Act are reproduced hereunder:—

"Agreement" includes an agreement arrived at by means of valuation or otherwise, and "agreed" has a corresponding meaning. This refers to an agreement as to the amount of compensation which will be paid for an improvement.

"Agricultural committee" means an agricultural committee constituted under this Act.

"Contract of tenancy" means a letting of or agreement for letting land for a term of years, or for lives, or for lives and years, or from year to year, and includes a letting of land under a tenancy at will. Such a contract will include verbal as well as written agreements.

"Holding" means any parcel of land being not less than two acres in area held by a tenant which is used or intended to be used for purposes which are either wholly agricultural or wholly pastoral, or in part agricultural and as to the residue pastoral, and which is not let to the tenant during his continuance in any office, appointment or employment held under the landlord, but does not include any land cultivated as a garden.

"Landlord" means any person for the time being entitled to receive the rents and profits of any land, but shall not include the Crown or any statutory body representing the Crown. Under this definition a tenant who sublets or who enters into a share-farming agreement in respect of the land, would be a landlord.

"Manuring" means any of the improvements numbered twenty, twenty-one and twenty-two in Part III of the First Schedule to this Act. (See list on page 265 of this article.)

"Pastoral purposes" includes dairying.

"Rules of good husbandry" means (due regard being had to the character of the holding) so far as is practicable, having regard to its character and position:—

(a) The maintenance of the land (whether arable or pasture) clean and in a good state of cultivation and fertility and in good condition; and

(b) The adoption of farming methods to mitigate or prevent soil erosion;

(c) The maintenance and clearing of drains, embankments and ditches; and

(d) The maintenance and proper repair of fences and gates; and

(e) The execution of repairs to buildings, being repairs which are necessary for the proper cultivation and working of the land on which they are to be executed; and

(f) Such rules of good husbandry as are generally recognised as applying to holdings of the same character and in the same neighbourhood as the holding in respect of which the expression is to be applied:

Provided that the foregoing definition shall not imply an obligation on the part of any person to maintain or clear drains, embankments or ditches, if and so far as the execution of the works required is rendered impossible (except at prohibitive or unreasonable expense) by reason of subsidence of any land or the blocking of outfalls which are not under the control of that person, or, in its application to land in the occupation of a tenant, imply an obligation on the part of the tenant:—

(i) To maintain or clear drains, embankments or ditches, or to maintain or properly repair fences or gates where such work is not required to be done by him under his contract of tenancy; or

(ii) To execute repairs to buildings which are not required to be executed by him under his contract of tenancy.

"Tenant" means the holder of land under a contract of tenancy, and includes the executors, administrators, assigns, guardian, committee of the estate or trustee in bankruptcy of a tenant or other person deriving title from a tenant.

The designations of landlord and tenant shall continue to apply to the parties until the conclusion of any proceedings taken under or in pursuance of this Act in respect of compensation. This paragraph is designed to preserve the rights of the parties, even though the tenancy may be at an end.

Where the tenant of a holding before receiving notice that the person theretofore entitled to receive the rents and profits of the holding (hereinafter referred to as "the original landlord") has ceased to be so entitled, and also notice of the name and address of the person who has become entitled to receive such rents and profits, serves on the original landlord any notice, request, demand or other instrument, such notice, request, demand or other instrument shall be deemed to have been served upon the landlord of such holding. By virtue of this paragraph the rights of a tenant are not lost if the holding has been transferred by the owner, without notice to the tenant.

Share-farming Agreements (Section 5).

This section of the Act provides that this Act shall (except where otherwise expressly provided) apply to and in respect of share-farming agreements, and the parties to any such agreement in like manner as it applies to contracts of tenancy and the parties to any such contract.

In this section the expression "share-farming agreement" means an agreement made between a person (in this section referred to as the "owner") for the time being entitled to the rents and profits of any land and another person (in this section referred to as the "share-farmer") whereby:—

(a) The owner grants a license to the share-farmer to use and occupy the whole or any part of the land (being not less than two acres in area) for agricultural or pastoral purposes or partly for agricultural and partly for pastoral purposes; and

(b) The share-farmer undertakes to provide labour either with or without materials or stock for the working of the land to which the agreement relates; and

(c) The owner and the share-farmer agree that the produce of the land to which the agreement relates, derived during the currency of the agreement, or the proceeds of the sale of such produce, shall be divided between the parties in specified proportions or shares.

In the application of this Act to and in respect of a share-farming agreement and the parties thereto:—

(a) A reference to a contract of tenancy shall be construed as a reference to a share-farming agreement;

(b) A reference to a tenancy shall be construed as a reference to the use and occupation of land by a share-farmer;

(c) A reference to a landlord shall be construed as a reference to an owner who is a party to a share-farming agreement;

(d) A reference to a tenant shall be construed as a reference to a share-farmer;

(e) A reference to a holding shall be construed as a reference to land which a share-farmer is authorised to use and occupy pursuant to a share-farming agreement;

(f) A reference to rent shall be construed as a reference to that proportion or share of the produce of land to which a share-farming agreement relates derived during the currency of the agreement or of the proceeds of the sale of such produce to which, in accordance with the provisions of the agreement, the owner is entitled.

PART II.

Transitory Provisions (Section 6).

This portion of the Act deals with the right of a tenant to compensation for improvements under the Rural Tenants Improvements Act, 1916, as amended.

A tenant who has carried out any of the improvements listed in the First Schedule to the Rural Tenants Improvements Act, 1916, is entitled, at the termination of the tenancy on quitting the holding, to obtain as compensation from the landlord an amount which fairly represents the value

of the improvement to an incoming tenant. This applies only to a tenant who quits his holding after the commencement of the Agricultural Holdings Act, and does not apply to tenancies terminated prior to that date, in which case the tenant may enforce his rights under the Rural Tenants Improvements Act, 1916. Compensation may be claimed for any improvement which was made prior to the commencement of the Agricultural Holdings Act, or after such commencement if notice of intention to make the improvement was given by the tenant to the landlord before such commencement.

In cases where the landlord and tenant have reached an agreement under the Rural Tenants Improvements Act, 1916, as to the compensation to be paid for an improvement, such compensation shall be substituted for compensation under this Act. If a tenant claims to be entitled to compensation under this section and a disagreement arises as to the amount, time and mode of payment, the matter shall be referred to arbitration under this Act.

The amount of compensation payable is arrived at on the basis of the value of the improvement to an incoming tenant. The incoming tenant is a hypothetical person, and what an actual incoming tenant may think the improvement to be worth has no bearing on the case. Normally, in practice, the incoming tenant, with the consent of the landlord, would pay to the outgoing tenant any amount payable to the latter for compensation for improvements, he in his turn being paid by an incoming tenant when vacating the holding. An incoming tenant should always consult the landlord before paying compensation for improvements to the outgoing tenant. The landlord may desire to present counter claims for deteriorations or for rent due. Although there may be no incoming tenant, compensation is none the less payable, and in cases where there is no incoming tenant, the landlord is responsible for the payment of any compensation to the outgoing tenant.

The value of an improvement to an incoming tenant would be assessed following consideration of factors such as the original cost of the improvement, the amount of use obtained from it by the outgoing tenant, and its practical value to the property. As an example, a tenant claiming compensation for permanent subdivision fences would need to show that the improvement facilitated grazing management and that it was carried out in a reasonable and practical manner. Should the improvement have been carried out, say, five years prior to the termination of the tenancy, the use he had obtained from it would be taken into consideration in assessing compensation.

The original cost of an improvement may have little bearing on the amount awarded as compensation. Changing conditions of agriculture may result in an improvement being of little value to an incoming tenant. Where an improvement has been extravagantly executed or excessive expenditure has been incurred in effecting it, account will be taken only of the reasonable requirements in the particular circumstances, when assessing the compensation payable for the improvement. Unnecessary improvements may not receive any compensation at all.

A Green Manure Crop on a North Coast Farm.

Eight weeks' old Poona cowpeas at Tabulam.

Should a tenant claim compensation for an improvement under the Rural Tenants Improvement Act, 1916, he is not entitled to compensation under the Agricultural Holdings Act for the same improvement.

PART III.

Division I.—The Right of a Tenant to Compensation for Improvements (Sections 7 to 12).

A tenant is entitled at the termination of the tenancy on quitting the holding to claim compensation for any of the improvements listed in the First Schedule to the Act (see later on page 265 of this article). This applies to any improvement made after the commencement of the Act as long as the tenant has fulfilled his obligations in regard to the procedure governing the carrying out of any improvement listed in Parts 1 and 2 of the Schedule. The fact that the tenant may be required to carry out any of these improvements by the terms of his tenancy agreement does *not* nullify his claim to compensation for such item.

Where the landlord has provided some benefit to a tenant in consideration of the tenant executing an improvement, the tenant may still claim compensation for the item in question when quitting the holding on the termination of the tenancy, but the benefit allowed by the landlord would be taken into consideration when calculating the amount of compensation.

On quitting the holding at the termination of his tenancy, the tenant may claim compensation for the value of manures and artificial fertilisers used (First Schedule, Part III, item numbers 20, 21 and 22). In arriving at the amount of compensation payable to the tenant for manuring crops grown on and sold off or removed from the holding during the last two years of tenancy, the landlord may be allowed, as a set-off against the amount claimed, the value of any manures used in accordance with the contract of tenancy, or by the custom of the district. The set-off allowed on this account will not exceed the value of the animal manure which would have been produced had the crops been consumed on the farm.

A tenant may claim compensation for any improvement under custom, agreement or otherwise in lieu of compensation under the Act. He cannot claim under both.

Parts I and II Improvements.

In dealing with compensation for improvements, the tenant's obligations regarding the improvements enumerated in Parts I and II of the First Schedule must be emphasised. Compensation under this Act for these improvements shall *not* be payable unless the tenant of the holding has, not more than three, nor less than two, months before beginning to execute the improvement, given to the landlord notice in writing of his intention to carry out the improvement. In addition he must indicate the manner in which he proposes to do the intended work. Upon such notice being given, the landlord and the tenant may agree upon the terms as to compensation or otherwise on which the improvement is to be executed. Should such an agreement secure to the tenant *fair and reasonable* compensation, the compensation so secured shall be substituted for compensation under this Act. It should be noted that the term "fair and reasonable" would be governed by the circumstances existing at the time of making the agreement. It is possible that a tenant could enter into an agreement securing to him fair and reasonable compensation for an improvement. Before the expiration of his tenancy changing conditions of agriculture may have greatly enhanced the value of the improvement. This would not entitle the tenant to any increase in the amount of compensation for this item. On the other hand, a similar improvement carried out with the approval of the landlord, but for which no provision for compensation had been arrived at by agreement, would be dealt with on its merits at the termination of the tenancy.

Should a landlord disagree with the proposal of a tenant to carry out any improvement included in Part I of the First Schedule, he may, within one month of his receiving notice from the tenant regarding his intention to carry out the improvement, inform the tenant of his objection, and require the matter to be referred to an Agricultural Committee for decision. Should the Agricultural Committee decide that the improvement will not be suitable and desirable, the tenant shall not, if he executes the improvement, be entitled to any compensation for it.

If the Agricultural Committee decides that the improvement is suitable and desirable, and if the landlord has not agreed to the tenant carrying out the improvement, the landlord may execute the work himself and receive from the tenant as rent a sum not exceeding 5 per cent. on the outlay involved.

Should the landlord fail to carry out the work within a reasonable time, the tenant may proceed to effect the improvement. On the other hand, the landlord may permit the tenant to proceed with the work, in which case the tenant becomes eligible for compensation at the termination of his tenancy.

In regard to those improvements listed in Part II of the First Schedule, the tenant must give to the landlord the same notice as is required for Part I improvements.

The procedure would then be as follows:—

(1) The landlord may assent to the work being carried out by the tenant on terms arrived at by mutual agreement. Any fair and reasonable compensation so agreed upon would be substituted for compensation under the Act.

(2) The landlord may decide to execute the improvement himself and may charge the tenant as rent a sum not exceeding 5 per cent. per annum on the outlay involved.

(3) If the landlord does not adopt either of these two courses the tenant may proceed with the work in a reasonable manner, and may recover compensation under the Act.

It is important that the distinction between the improvements enumerated in Parts I and II of the First Schedule be appreciated. In one case the landlord may dissent and insist upon the matter being referred to the Agricultural Committee; in the other he cannot take any steps to prevent the work from being carried out by the tenant if he is not prepared to do it himself.

Landlords and tenants can simplify the procedure in regard to those improvements listed in Parts I and II of the First Schedule by an arrangement in the contract of tenancy or otherwise, agreeing to dispense with any notice.

Part III Improvements.

No notice is required to be given by the tenant to the landlord of his intention to execute Part III improvements. Unlike Part I and Part II improvements, the landlord has no right to execute Part III improvements himself.

It is important to note that the right to compensation which would be payable to a tenant for all the improvements comprised in Schedule I, only arises at the termination of the tenancy when the tenant quits the holding. Therefore the tenant loses his right to compensation if he quits the holding before termination of the tenancy. There is one exception to this rule, and that is when the landlord refuses or within a reasonable time fails to agree to a demand made to him in writing by the tenant, for arbitration under the Act as to the rent to be paid for the holding as from the next ensuing date at which

the tenancy could have been terminated by notice to quit given by the tenant at the date of the demand and if, by reason of such refusal or failure, the tenant terminates the tenancy because of that reason, he shall still be entitled to compensation for any improvements he has carried out on the holding during his tenancy in accordance with the Act.

Lodgment of Claims.

Where a tenant claims to be entitled to compensation for any of the improvements enumerated in Parts I, II and III of the First Schedule to the Act, and the landlord and tenant fail to agree as to the amount and time and method of payment, the matter shall be settled by reference to an Agricultural Committee.

The tenant must furnish to the landlord particulars of his claim for compensation within two months after the termination of the tenancy, otherwise his claim cannot be enforced. There is special provision, however, for the case where a tenant lawfully remains in occupation of part of a holding after the expiration of the tenancy, in which case particulars of his claim relating to that part may be given within two months from the termination of his occupation of that part.

The term "fair and reasonable" as applied to compensation for improvements, is designed to safeguard the interests of tenants who, because of various circumstances, may enter into agreements limiting compensation to nominal amounts. Should a tenant feel that the amount of compensation provided for in the agreement is inadequate, he may require the matter to be referred to an Agricultural Committee for decision.

The First Schedule to the Act.

For the sake of convenience the First Schedule to the Act is reproduced hereunder.

PART I.—Improvements regarding which the landlord must be notified in writing and to which he may dissent and require the matter to be dealt with by an Agricultural Committee:

(1) *Erection, alteration or enlargement of buildings, except as provided for in Part III of this Schedule, and except in regard to alterations to milking bails.*

(2) *Erection and construction of silos.*

(3) *Making of works of irrigation.*

(4) *Making or improvement of watercourses, ponds, wells or dams or of works for the application of water power or for the supply of water for agricultural or domestic purposes.*

(5) *Making or removal of permanent boundary fences and the erection of rabbit-proof, dog-proof or marsupial-proof fences or the making of fences rabbit-proof, dog-proof or marsupial-proof.*

(6) *Planting of orchards, fruit bushes, banana, sugar-cane, pineapple or cow cane plants, and oil, fodder, timber or firewood trees.*

(7) *Reclaiming of waste land.*

A Renovated *Paspalum dilatatum* Paddock on which Perennial Rye Grass and Red Clover were sown.

Red and white clovers have responded excellently to the application of 1½ cwt. per acre of superphosphate in this and other coastal areas.

(8) *Embankments and sluices against floods, contour banks to mitigate or prevent soil erosion, and the planting of trees to mitigate or prevent soil erosion.*

(9) *Provision of permanent sheep-dipping accommodation.*

(10) *Ringbarking, suckering and the clearing of timber except in the case of cultivation or cropping land.*

PART II.—Improvements regarding which the landlord must be notified, which he may carry out himself, but to which he cannot object:—

(11) *Domestic water supply.*

(12) *Drainage.*

(13) *Making or improvement of necessary roads or bridges.*

(14) *Clearing and removal of stumps and logs from cultivation or cropping and pasture land.*

(15) *Destruction of prickly-pears, briars, blackberries, lantana.*

PART III.—Improvements which the tenant may carry out without reference to the landlord:—

(16) *Making of permanent subdivision fences.*

(17) *Laying down of permanent pastures.*

(18) *Claying of land or the spreading of sand, loam or bush scrapings.*

(19) *Liming and the application of other calcium compounds to land.*

(20) *Application to land of purchased artificial fertilisers or other purchased manures.*

(21) *Consumption on the holding by cattle, sheep or pigs, or by horses other than those regularly employed on the holding of grains, cake or other feeding stuff not produced on the holding.*

(22) *Consumption on the holding by cattle, sheep or pigs or by horses other than those regularly employed on the holding of grains, proved by satisfactory evidence to have been produced and consumed on the holding.*

(23) *Laying down temporary pasture with clover, grass or other seeds in so far as the value of the temporary pasture on the holding at the time of quitting exceeds the value of the temporary pasture on the holding at the commencement of the tenancy for which the tenant did not pay compensation.*

(24) *The growing of green manure crops for the purpose of maintaining or improving soil fertility.*

(25) *Repairs to buildings being building necessary for the proper cultivation or working of the holding, other than repairs which the tenant is himself under an obligation to execute:*

Provided that the tenant before beginning to execute any such repairs shall give to the landlord notice in writing of his intention, together with particulars of such repairs, and shall not execute the repairs unless the landlord fails to execute them within a reasonable time after receiving such notice.

(26) *Repairs to or re-erection of buildings to meet the requirements of the Dairies Supervision Act,* 1901, *and any other Acts.*

(27) *Repairs to and the cleaning of silt from wells, bores, dams and reservoirs.*

Continuous Tenancies.

It should be clearly understood that the tenant's rights to claim compensation for improvements are not limited to those improvements carried out during the tenancy on the termination of which he quits the holding. A tenant may enter into a contract of tenancy covering a certain term during which time he carries out improvements for which he is eligible for compensation, and at the end of that term he may enter into another agreement for a further term of tenancy. When he finally quits the holding he may claim compensation for the improvements carried out during the first as well as any subsequent periods of tenancy.

As mentioned previously, in most cases the incoming tenant will, in practice, pay any compensation for improvements due to the outgoing tenant. He in his turn, provided the landlord has consented to the payment of the compensation to the outgoing tenant, will be entitled to claim compensation for the same items when he quits the holding. This does not imply that he will be entitled to the same amount of compensation, as in most instances there will be some depreciation in the improvement during his period of tenancy. Again in practice this tenant will probably be paid by the next incoming tenant who will, if the landlord has consented to the payment, secure the same rights of compensation.

Settlement of Claims for Compensation for Improvements.

The procedure regarding the settlement of claims for compensation for improvements is important. At the termination of a tenancy the tenant and landlord may agree as to the amount of compensation payable, if they have not already done so, or the incoming and outgoing tenants may reach an agreement with the consent in writing of the landlord. Should any dispute arise regarding the amount, and time and mode of payment, the matter shall be referred to an Agricultural Committee as arbitrators in accordance with the provisions set out in the Second Schedule to the Act, which will be discussed in a future section of this article.

(To be continued.)

Bush Fire Danger from Producer Gas Units.

THE Chief Secretary, Mr. Baddeley, directs attention to the bush fire danger arising from the careless use of producer gas units. The danger from leaving ashes on the side of the road is particularly emphasised. The experience has been that the live coals blow from the roadway amongst inflammable material nearby, and in a number of cases these have caused widespread fires.

Another cause for concern, states Mr. Baddeley, arises from persons not examining their units to ensure that they are fitted and functioning in a proper manner. It has been found that fires have been caused by the escape of live coals from the container.

Under the Bush and Rural Fires Prevention Order, issued by the State Government under the National Security Regulations, heavy penalties are prescribed in respect of any person using a producer gas unit in a careless or negligent manner, or discharging or cleaning the fire box in such a way as may lead to the outbreak of a bush fire, or leaving any ash, clinker or other material in a burning or incandescent condition on any land. A person convicted of any offence under the Order, if prosecuted summarily, is liable to a fine of £100 or imprisonment for six months or both. If action is taken on indictment, the offender may be fined any amount or sent to gaol for any period or both.

A definite responsibility is placed on the owner of the vehicle to see that the unit is so constructed as to prevent the discharge therefrom of any fire, sparks or burning material on to any land during the period the vehicle is being operated. The police have been instructed to enforce the bush fire laws rigidly.

NOTES CONTRIBUTED . . . .
BY THE BIOLOGICAL BRANCH.

SOIL ACIDITY AND THE GROWTH OF VEGETABLES.

THE importance of soil acidity to plant growth and health has been recognised for many centuries, and the practice of applying lime to soil to correct "sourness" or acidity has grown up because of it. From this practice has developed the recognition of degrees of soil acidity just as there are degrees of heat and cold, and the recognition of the preference of different plants for soils of different acidities. It is opportune, therefore, during the present drive for vegetables to consider the possible effect of different soil acidities on yield, health of the crops and uniformity of development in relation to harvesting and processing, in order to be certain that improvements cannot be made or losses prevented. It is wise, also, to reflect as to whether certain soils, though they have proved eminently suitable for cereals and pasture, can be turned over to maximum production of vegetables without adjustment of acidity. This thought arises when it is remembered that many of the soils in our coastal, tableland and even more inland areas are strongly acid in their virgin state.

There is a widespread, though erroneous, impression that all acid soils are undesirable, and that the aim of the farmer should be to correct the acidity and render them "sweet." The facts are that many plants flourish only in strongly acid soils, and most grow best when the soil is mildly acid. There is, however, an optimum, or most congenial, range of soil acidity for each vegetable, at which it makes most satisfactory growth, and the aim of the grower ought to be to adjust matters accordingly.

Soil acidity influences plant growth chiefly indirectly—by affecting the availability to the plant of essential minerals, by the liberation or formation of toxic substances in the soil, by its effect on the formation of humus and, later, nitrates by bacterial action and on the development of nodules by leguminous plants, or by encouraging or retarding certain soil-borne diseases (*e.g.*, potato scab).

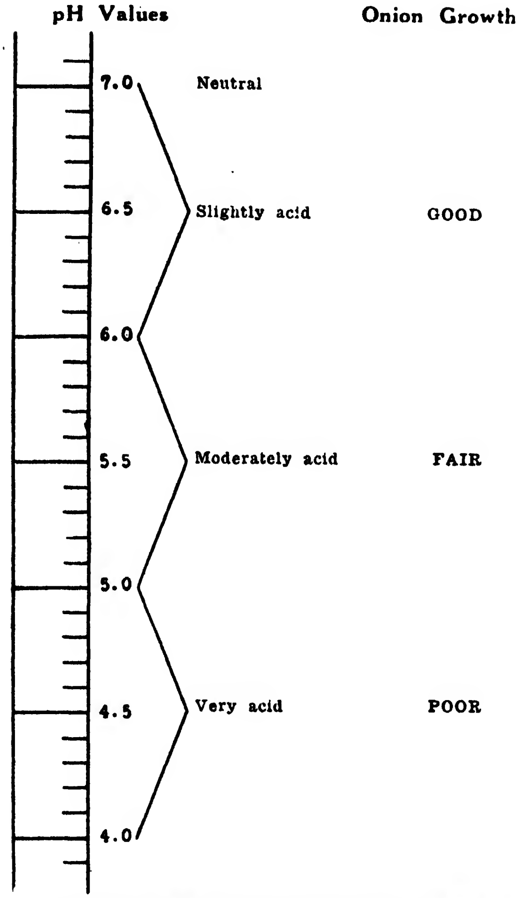
The degree of soil acidity is really an indication in a general way of the chemical condition of a soil. If a soil is very acid many of the minerals essential for normal growth, *e.g.*, calcium, magnesium and potash, may be absent or in short supply as a result of having been leached, or other minerals may come into solution in amounts which will be toxic. If a soil is too alkaline (the opposite of acid) certain essential minerals, such as iron and manganese, may be relatively unavailable because they are not readily soluble under these conditions, and in extreme cases salts deleterious to the plants may accumulate. The signs of distress shown by plants when attempts are made to grow them under these highly unfavourable conditions are usually retarded growth, paleness, complete or partial yellowing and, in some cases, death of parts or of the whole plant. Under less extreme conditions, however, plants may make fair to moderate growth and appear satisfactory, although yielding neither the quality nor quantity of crop they would under optimum conditions of soil acidity.

Measuring Soil Acidity.

The most widely used method of recording soil acidity is in terms of the pH scale; a procedure somewhat akin to that of recording temperatures, say, on the Fahrenheit scale. It is unnecessary to inquire into the basis of the pH scale any more than we ordinarily do regarding the temperature scale.

The pH scale ranges from 1 to 14, with its mid or neutral point at pH 7. Figures less than 7 indicate acidity, while figures above 7 indicate degrees of alkalinity. The essential point to remember in using the pH scale for expressing soil acidities is that the acidity increases as the pH figures decrease;

e.g., a soil registering pH 5 is more acid than one reading pH 6. It should be remembered, too, that the intensity of the acidity represented by the figures increases very steeply as the pH figures decrease. If we express the acidity of pH 7.0 by the figure 1, then pH 6.0 would be expressed by the figure 10, pH 5.0 by the figure 100 and pH 4.0 by the figure 1,000. This may aid in understanding why the growth of various crops is often so greatly affected by apparently small changes in pH values at what may be termed the critical points for those crops.



Graphical Representation of the Relation between Soil Acidity and Growth of Onions.
[*After Jones.*

The determination of the pH of a soil is a relatively simple operation, but for purposes of accuracy it is generally undertaken by soil chemists. Samples of soil concerning which there is reason for doubt may be submitted, without charge, to the Chief Chemist, Department of Agriculture, by commercial vegetable growers. Mixed samples of five or six separate collections of an ounce or so of surface soil from different parts of the area under question are all that is necessary.

Optimum pH Values for Growth of Different Vegetables.

The optimum pH values at which the different vegetable crops may be expected to make the best growth when other conditions are favourable are given in the accompanying table.

Crop.	Optimum pH Range for Growth
Asparagus	6·0–7·0
Beans—French	5·5–7·0
„ Navy	6·0–7·0
„ Soy	5·5–7·0
Beet	6·0–6.7
Cabbage	5·5–6·7
Carrot	5·2–6·7
Cauliflower	6·0–6·7
Celery	5·5–6·7
Cucumber	5·5–6·7
Lettuce	5·0–6·5
Onion	6·0–7·0
Parsley	5·0–7·0
Parsnip	6·0–6·7
Pea	5·8–6·7
Potato*	4·8–7·0
Radish	5·2–6.7
Rhubarb	5·5–6·5
Rock-melon	6·0–6·7
Silver Beet	6·0–6·7
Spinach	6·0–6·7
Sweet Corn	5·0–6·5
Sweet Potato	5·2–6·7
Tomato	5·2–6·7
Turnip—Swede	4·8–6·5
„ Table	5·2–6·7

* pH 4·8–5·4 to be preferred because of common scab disease.

Highly acid soils are especially objectionable in the growth of peas, beans and other legumes. Deficiency in lime and phosphates, usually associated with such acid soils, retards growth, but more important, it tends to prevent the development of root nodule-forming bacteria which, if present, assist in supplying nitrogen to the legume by the fixation of this costly nutrient from the air. Inoculation of seed of leguminous crops with nodule bacteria is rarely very successful if the soil in which the crop is sown is more acid than pH 5.5.

Correcting Soil Acidity.

Soil acidity is one factor which is largely under the control of the grower. Correction of acidity is best made by the addition of finely ground limestone or dolomitic lime to the soil, preferably some months before a

crop is sown or planted out. The rate of application necessary will vary with type of soil as well as its degree of acidity. In the case of an average loam, an application of 1½-2 tons of lime would be necessary to move the pH of a soil from pH 5.0 to pH 5.8 or 6.0.

The lime is best broadcast and ploughed in. Further, though lighter, applications may be necessary every two or three years. With leguminous crops which are sown in drill rows in soils more acid than pH 5.5, light applications of lime along the rows may be profitable. Lime and superphosphate may be mixed and drilled in together.

Leaf Curl of Stone Fruits.

Necessary to Spray at Correct Periods.

THE leaf curl disease of stone fruits, caused by the parasitic fungus *Taphrina deformans*, and which should not be confused with the leaf curling that results from aphid infestation, is readily controlled by spraying with either Bordeaux mixture, 6-4-40, or lime sulphur, 1 per cent. (approximately 1 gallon to 20 gallons of water in the case of commercial lime sulphur, or 1 in 14 in the case of home-made lime-sulphur).

Leaf Curl of the Nectarine (*Taphrina deformans*).

[From the Transvaal Agricultural Journal.

Time of Application.

The time of application is most important. The spray must be applied prior to bud-burst, preferably whilst the blossom buds are swelling. Successful control is rarely obtained if the spray is applied after the leaf buds have burst. Every effort should be made to ensure that the spray reaches all portions of the tree and particularly the extremities of small limbs and twigs.

Bordeaux mixture has been found to be slightly more effective than lime sulphur under conditions which favour the development of the disease. It has the additional advantage of greater durability on the tree. Consequently, if the grower is obliged, because of other work, to spray some time in

advance of bud swell, then Bordeaux mixture is to be preferred to lime sulphur. Should the grower use lime sulphur a few weeks before bud swell and showery weather occur, it would be essential to make another application of this spray at a fairly late stage of bud swell.

Lime sulphur, on the other hand, has the advantage that it controls certain scale insects whereas Bordeaux mixture has rather the opposite effect.

Black Spot of Grape Vines.

BLACK spot or anthracnose is one of our most serious diseases of grape vines. It is due to a parasitic fungus, *Elsinoe ampelina*, which can attack all young parts of the vine. On the shoots the spots are brownish black and sunken, with a raised border, and

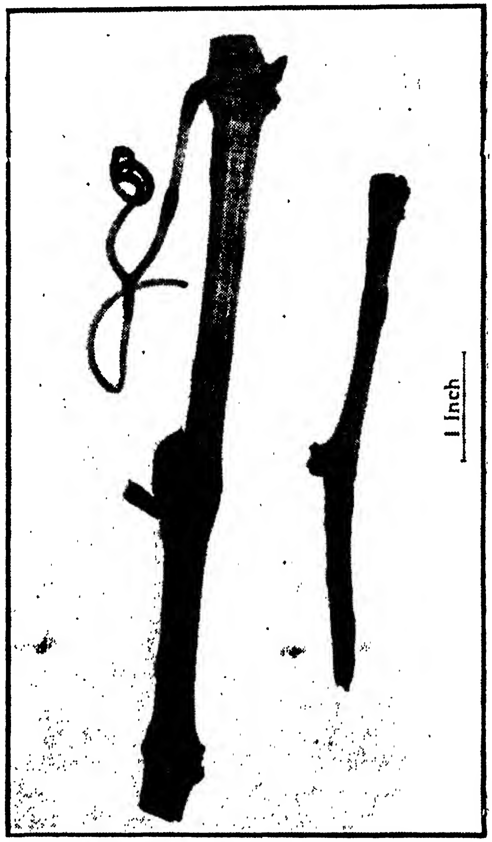
Black Spot of Grapes.

later become grey. In severe cases definite cankers are produced on the canes. On the fruit, brown circular spots are caused, which become greyish with dark or reddish borders. The leaf spots are grey with dark-red borders and later turn black, sometimes falling out, giving the leaf a shot-holed appearance.

Wet or humid weather is specially favourable for the development of the disease, and under conditions such as obtained in the spring of last year, serious losses are experienced by growers who neglect to spray.

Control.

The first spray application should be made just prior to bud burst. Bordeaux mixture, 6-4-40, or lime sulphur, 1 in 8, may be used,



Black Spot Cankers on Canes and Tendrils of Grape Vine.

the lime sulphur, however, having the additional advantage of being effective in the control of mites (Insect Pest Leaflet No. 44). A further spray application of Bordeaux mixture, 6-4-50, should be made when the shoots are about 6 inches long. If weather conditions favour the disease, spray with Bordeaux, 6-4-50, just before blossoming, and again as soon as the fruit has set.

War Gossip is Dangerous. Guard Your Tongue.

The Deciduous Fruit Position.

Points to Consider Before Planting New Areas.

K. D. McGILLIVRAY, Orchardist, Wagga Experiment Farm.

THERE are many sound reasons why some growers of deciduous fruits should extend their areas—provided sufficient labour is available to carry out the planting and to care for the young trees after they have been planted—but the circumstances should be carefully examined before planting is undertaken.

In some instances trees in various orchards are getting old and new areas should be planted to take the place of the old trees which, in a few years will have passed their economic life. In others a grower may wish to establish a new area for some member of his family who could take it over after he has returned from work directly associated with the war effort.

Again powerful influences are affecting the eating habits of the Australian people. The voices of the dietitian, the family doctor, and the dentist all acclaim the virtues of fruit-eating from their several points of view. Wide-spread association with men from the United States of America, whose fruit consumption per capita is higher than ours, will have an effect. The value of health-giving drinks such as cider and other fruit juices is already recognised in this country and the American influence should stir this into greater life.

If the grower has land which is already fenced and prepared, very little extra expense is involved in the extension, as the cost of purchasing and planting trees does not amount to very much, and where growers have suitable equipment, the cost of maintaining the young area, at least for a few years, is negligible.

Stone Fruit.

Stone fruit trees, such as peaches, nectarines, and plums, are short lived. Taking about five years to commence worth-while cropping, they go on "pulling their weight" for a further fifteen years after which they usually commence to decline. Inevitably the time comes when they are no longer profitable. Various methods have been attempted to prolong their useful life. More or less success has attended pruning to reduce the bearing area in the hope of making the best use of the declining vigour, manuring, and sometimes a belated change over to better cultural and soil-management practices. The "doctoring" may increase the yield but frequently at a cost which is too great.

The present high prices are a reflection of the high spending-power of the consumer

and tend to mask the decreasing production of old trees. "Half the crop at twice the price pays quite well. The old trees are bringing in as much money as ever they did." By all means keep the trees if they are profitable, but it must be remembered that if prices fall the trees may suddenly become unprofitable.

If the grower wishes to go on with the job he must make use of the knowledge which we now have of the life-span of different kinds of fruit trees under our conditions, and time the planting of young trees in anticipation of the decline of older plantings.

Cherry production is on the decline, and with the limitation of districts able to grow cherries, it does not seem that there is a likelihood of over-production. The intro-

Young Apple Trees Square-planted on Almost Level Land, showing Strip Cultivation.

duction of crystallisation in New South Wales has opened up another means of disposal not available only a few years ago. Indiscriminate planting of cherry trees must be avoided. To be successful they must be planted, not only in selected districts but on selected areas in such districts. The soil and climatic conditions must be just right, otherwise the planter will find the trees dying and his asset collapsing very early in the life of the trees.

What is the prune position? Most of our trees are reaching the stage when costs of production will go up due to decline of trees and cropping. Any grower with trees around the twenty-five years mark should be thinking over the question of planting a new area.

Apples and Pears.

A careful survey of the prospects should be made before planting new areas to apple trees in this State. In a district such as Oakdale, planting can only proceed as the local demand for fruit from this area increases. It must be borne in mind also that growers in this district market their fruit in competition with big supplies of soft fruit grown in coastal or near coastal areas. Any big extension in this district would be detrimental.

In the case of districts such as Batlow, Orange and New England, more extensive plantings can be carried out. These areas not only supply the local market but also, in normal times, the fruit can be exported to the East and to the United Kingdom. In addition, fruit from these areas may be cool stored, some varieties keeping well until December and January, thus giving growers in these areas a longer marketing period for their fruit.

Apples and pears live longer but the same problems connected with the decline of the trees eventually arise.

Other considerations common to both pome and stone fruit, concern varieties, districts and sites. Our pioneering experiences with this and that variety in all sorts of promising and unpromising places have yielded ample evidence of the uneconomic, and at times disastrous, results from planting the wrong variety in the wrong district and on the wrong site. Sometimes we see a combination of all these and frequently one or more of them.

Many points can be raised on this issue but one that is most important is that certain districts possess advantages of soil and climate for the production of late-maturing, long-keeping apples. The worst of the pioneering stage is now over and growers in the well-established late districts have access to such facilities as cool storage and packing sheds. In addition they can draw on the fund of knowledge of handling export fruit which these fruit-growing communities have built up in the course of their development.

The market also demands early apples but there is little profit in growing them in late districts. Apple trees which possess the inherent ability to mature fruit quickly should be grown in an environment which favours

DEPARTMENT OF AGRICULTURE, N.S.W.

PASSION-FRUIT CULTURE ON THE NORTH COAST

(*Farmers' Bulletin No.* 169.)

by

H. W. EASTWOOD, H.D.A., Senior Fruit Instructor.

The North Coast is eminently suited to the production of passion-fruit, and particularly of early crops. For the best results, however, it is essential that the producer should have a thorough knowledge of his business. Every aspect, from the selection of the site of the vineyard to the packing and marketing of the fruit, is dealt with in detail in this publication.

54 pages. *Copiously Illustrated.*

PRICE, 2s.; BY POST, 2s. 1d.

Obtainable from

THE DEPARTMENT OF AGRICULTURE, BOX 36A, G.P.O., SYDNEY, OR THE GOVERNMENT PRINTER, PHILLIP ST., SYDNEY.

RESERVATION OF TRAIN SEATS.

COMMENTS in certain country newspapers make it appear that misapprehension exists as to the reason for the revised arrangements (introduced at the end of April and announced in the May issue of the *Agricultural Gazette*) in connection with the booking of seats on "optional" trains. So far from causing hardship to outback residents, the intention of the Commissioner for Railways, Mr. Hartigan, was that the new regulations should have the opposite effect. For example, a traveller joining a Sydney-bound "optional" train can now occupy any vacant seat, without the likelihood that he will have to leave it later on because some passenger travelling a much shorter distance has reserved the seat.

The Commissioner found that the practice of seat "jumping" was increasing, because the shortage of staff made it impossible to check all "optional" trains to make sure that seats were occupied by those who had paid to reserve them. He decided, therefore, to discontinue the booking of seats on Sydney-bound "optional" trains. The reason arrangements were not disturbed in connection with passengers joining out-bound "optional" trains at Sydney was that the staff there is sufficient to ensure that passengers who have reserved seats get them.

S. R. NICHOLAS,
Secretary for Railways.

early maturity. The trees and the local conditions then work together to catch the early market.

Only a very limited number of varieties of pears are in popular demand. The districts where these varieties can be produced at a profit are even more limited than in the case of apples.

Use of Labour and Machinery.

Many fruit growers who have an area which is suitable for planting will probably find that they already have sufficient equipment to handle additional acreage. If they have not, co-operative effort in the use of labour and machinery may get over the obstacle. This applies particularly to mechanised equipment which may not be fully occupied on the owner's property and could be used to help men with smaller units.

Strip Cultivation.

The maintenance of young trees is not costly in the early years and makes only small demands on labour. Pest control and pruning are at a minimum and cultural costs can be further reduced by strip-cultivation. Ploughing and cultivating the whole area may give the place a neat and tidy appearance, but much of this work is done beyond the feeding range of the roots of young trees for several years. A strip of cultivation on each side of the trees, representing about half of the total area will give them a start and can be widened as the trees grow. If possible, self-seeding legumes such as clovers can be encouraged in the uncultivated strips, and at the same time a sharp look-out maintained for undesirable weeds. Under these conditions soil fertility should be improved and erosion reduced.

Vegetables as a Sideline.

Where conditions are suitable many orchardists have now added vegetable growing to their activities, and many more use this means of "pot-boiling" when their orchards are young. If one or two precautions are taken, vegetables can be grown between young trees and the area still remain an orchard—and not become a vegetable garden. Care is needed under irrigation to avoid over-watering, with possible harmful effects to the trees.

Strip Cultivation on a Contour-planted Block of Pear Trees.

Under both irrigation and natural rainfall conditions, strong growing vegetable crops can compete seriously with fruit trees for moisture and plant food, if they are planted too close to them. It is necessary to be fair to the trees and give them sufficient living space.

Contour Planting.

Laying out an orchard on a slope should not commence until the question "Can this area be contour planted?" has been properly answered. Contour planting pays two kinds of dividends. Fast falling rains move off slowly along the contours and soak in; this dividend is an annual one and commences

soon after the trees are planted. The second dividend starts early and the rate of payment increases as the years go on. On the square-planted, sloping orchard, which is unprotected, fertility goes downhill with the soil at an ever increasing rate. Contour planting, and banking where necessary, preserve the asset; the best of the top-soil stays around the trees instead of piling up on the bottom fence. No great amount of technical skill is required to lay out an orchard for contour planting. Simple and practical methods which have been devised to suit our own conditions can soon be mastered.

Pollination.

A variety which will not fruit unless the pollen of another variety is borne to it needs little discussion; such self-sterility is overcome by planting the pollinating variety with it. There are, however, less obvious cases of reduced returns due to lack of pollination. With some varieties which crop satisfactorily without pollinators under favourable conditions for the setting of fruit, experience has shown the value of cross pollination under unfavourable blossoming conditions. Trees within reach of the pollinating variety have cropped, while others have failed or almost so. The question of suitable pollinators should thus be looked into when planning a new planting.

A Warning.

Growers should not allow high prices for any particular kind or variety of fruit to stampede them into making a planting which is economically unsound. The result may be some profit when prices are high, but when the tide of prices goes back they are stranded with a second-rate site or a wrongly placed variety. Such wreckage from boom periods of the past can be seen in most of our fruitgrowing areas, and should serve as a warning against wanton planting.

Drainage of Citrus Orchards.

R. J. BENTON, Special Fruit Instructor.

BY drainage is meant the conducting of surplus water from the land by either surface or underground drains. The provision of surface drains on other than level land is essential, and is too frequently neglected. The object of surface drains is to direct the plough furrows which form these drains so that excessive rainfall is carried off the land at a very slow rate and does not erode the soil. Such furrows must be placed sufficiently close together to prevent a large accumulation of water, the distance between them being mainly determined by the area of land to be protected and by the amount of fall in the land. Any cultural operation which fills these drains or interferes with their functioning will necessitate their subsequent re-making. A fall of from ½ to 3 per cent. for surface drains is ample.

Unless land is naturally well drained it should not be planted with citrus trees, but in many well-drained soils there may be portions of the land which are defective in their ability to rid themselves of surplus water, often resulting from seepage from higher land.

The construction of deep open drains is sometimes possible, but in other cases the drains must be covered to facilitate cultural operations. In underground drains a very gentle and regular fall must be provided, otherwise a rapid flow of water may occur, which in time is likely to destroy the efficiency of the drain. Not more than 1 per cent. fall is advisable for a closed drain, which should be of suitable depth. Drainage tiles make the best drains, but they are costly, and large stones, split timber, etc., can be used effectively.

Where drains are down a steeper slope, they should be open drains. If they can be made wide as well as deep, the drain surface may be protected by encouraging grass to grow on it. The deeper the drain is placed the greater the area of land it will serve. In soils where an impervious clay is present at about 20 inches, drains 25 inches underground will suffice.

War Secrets Spread Like a Bush Fire. Don't Gossip.

INSECT PESTS.

Notes contributed by the Entomological branch.

The Fruit Tree Root Weevil.

(*Baryopadus squalidus.*)

THIS common and serious pest of citrus, apple, peach, plum and other fruit trees in the coastal districts and southern tablelands of this State is a native species, and the damage caused by it is much more extensive than is realised.

Although the adult weevils feed upon the foliage and buds, the injury caused by them is only of minor importance compared with the damage caused by the larvæ or grubs, which, feeding on the roots of the trees, gouge out deep furrows irregularly and spirally along the roots, which interfere with the normal sap supply. In severe infestations the roots are ringbarked to such an extent that the growth and productivity of the tree may be very seriously affected.

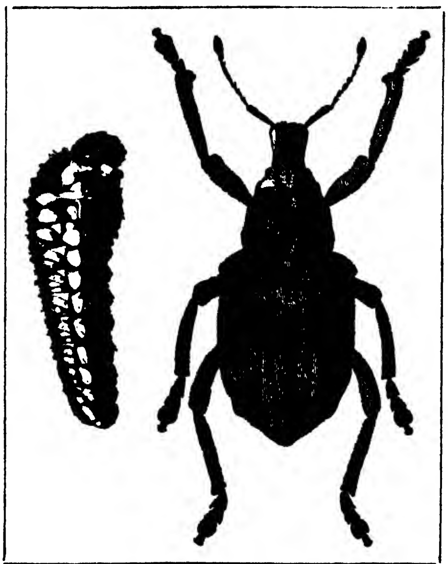
The whole growth of citrus trees is uniformly affected, but in stone and pome fruit trees the growth on one side only may be affected, while the other side may continue to develop normally.

The limbs of infested trees eventually become unproductive and may even die back, but in such instances a temporary, vigorous new growth is usually made in the lower parts of the trees. If the infestation continues, however, the trees eventually die and whole orchards may be destroyed when the beetles are allowed to remain unchecked for a number of years.

The damage to deciduous trees is mainly confined to the roots in the subsoil, those in the surface soil rarely being attacked. The appearance of the trees attacked varies to some extent with the depth and quality of the soil and also with the cultivation received.

Where the soil is shallow and of poor quality, the tree may soon die. Where it is deeper and more fertile, dying back may occur, but the tree continues to live on for a number of years and if cut back continues to make satisfactory new growth and may appear to have recovered, but it will eventually die if control measures are not undertaken.

In orchards where the soil is deep the limbs sometimes do not die back to any extent. This is due to the fact that only the roots in the subsoil are injured, and the tree is able to continue making a little growth each year. The general health of the tree suffers, however, especially in dry years.



Larva and Adult of Fruit Tree Weevil.

Life History.

The adult female weevil, which is about seven-eighths inch in length, is grey-buff in colour and has the head prolonged into a typical snout. The male weevils are similar in general appearance but smaller.

The eggs, which measure about one twenty-fifth of an inch in length, are elongate oval and somewhat flattened. They are laid in groups on the foliage, the female either folding a leaf or

drawing two leaves together and depositing the eggs between the two surfaces, which are glued together in the process. The average number of eggs laid in each group is about twenty-seven, but as many as eighty have been found in some.

The incubation period is about one week, and when the eggs hatch, the minute, elongate larvæ drop to the ground and at once make their way to the roots and commence to feed. When fully-fed the creamy-white larvæ, which are legless, measure about ¾ inch in length. They enter their pupal or chrysalis stage in the soil and later emerge as adults, which crawl to the surface and make their way up the trunks of the trees to the foliage. The beetles commence to emerge about the middle of June, and emergence continues until November. The greatest numbers appear during September. The life-cycle is at least one year and adult weevils under laboratory conditions have lived for more than ten months.

Control Measures.

Growers, particularly in districts where this weevil is known to occur, are urged to keep a close watch for any indication of its presence. If the trees become thin in foliage or sickly looking, or if some of the branches are not making new growth, the presence of this pest may be suspected and the trunks of some of the trees should be banded with a tree-tanglefoot or sticky banding material. If the condition of the trees is due to injury by the larvæ, the adults will be found later below the bands.

An examination of the roots of sickly trees will indicate whether the weevil larvæ have been at work.

Trees known to be infested, and even those in the same orchard not showing evidence of infestation, should be banded, in order to prevent any adults climbing the trunks to feed and deposit their eggs on the foliage.

Where the trunks of the trees are exposed to direct sunlight, it is advisable first to place a band of greaseproof paper around the trunks, or else to paint the surface of the bark with a bituminous paint, in order to prevent possible injury to the bark and to spread the banding material on this.

The banding material may be applied with a flat stick to form a ring about 3 inches wide and about ⅛ inch thick around the trunk. The banding material should be applied during the latter half of June and the bands will remain effective until all the beetles have emerged, provided the surface is freshened periodically by rubbing with a flat stick.

The weevils which congregate on the trunks below the bands should be collected and destroyed at frequent intervals—at least once a week. The bands should be placed as high as possible on the trees, so that the weevils can be more readily seen, and also to avoid, as far as possible, dust and leaves from accumulating on the bands.

It is essential to prune the lower branches of the trees, so that they are at least 6 inches from the ground, and to destroy weeds and grass, which, if allowed to grow up until they touch the branches, would enable the beetles to reach the foliage without crawling up the trunks.

Beneficial Ladybird Beetles (*Coccinellidae.*)

WITH the exception of one group belonging to the genus *Epilachna*, practically all the other members of this large family of beetles, which in Australia contains more than 250 different species, are beneficial insects, which, in both their larval and adult stages, feed upon and destroy aphids, scale insects, mealy-bugs, etc. In general, the life histories of these beetles are very similar to each other.

The 18-Spotted Ladybird (*Leis conformis*).

Both the larval or immature stages and adult forms of this lady-bird feed on aphids. It is a widely distributed species and is probably the most abundant. It is to be found in gardens throughout the greater part of the year and, at times, becomes particularly numerous.

Following upon early and severe infestations of green peach aphids, the trunks and main limbs of the trees may become densely covered with the pupæ of this species of ladybird.

Life History. — The eggs, which are spindle-shaped and yellow, are laid in small groups on the leaves or bark of

aphid-infested plants. The active, elongate larvæ vary from dark-grey to black, with orange markings. When fully-fed the larva, which then measures about 1/3 inch in length, attaches itself by the tip of the abdomen to the leaf or bark of the plant. Later the last larval skin splits and the larva passes into the resting pupal or chrysalis stage.

The adult ladybird is hemispherical in outline and may measure up to ¼ inch in length. It is bright orange yellow in colour, and is marked with a variable number of black spots—from sixteen to twenty—but usually eighteen.

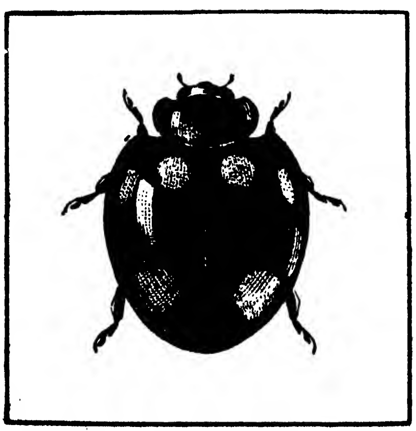
A number of overlapping generations occur during the year.

This useful aphid-eating species is sometimes confused with the injurious "28-spotted" or leaf-eating ladybird (*Epilachna 28-punctata*) which, in both its larval and adult stages, feeds on the foliage of various solanaceous and cucurbitaceous plants. When aphids are occurring on these plants it is not unusual to find the larvæ and adults of the two species of ladybirds present.

The wing-covers of the leaf-eating ladybird are not as shiny as the beneficial species and have a downy appearance. The larvæ of the injurious species are readily distinguished from the other ladybird grubs, as they are covered with numbers of branching black spines.

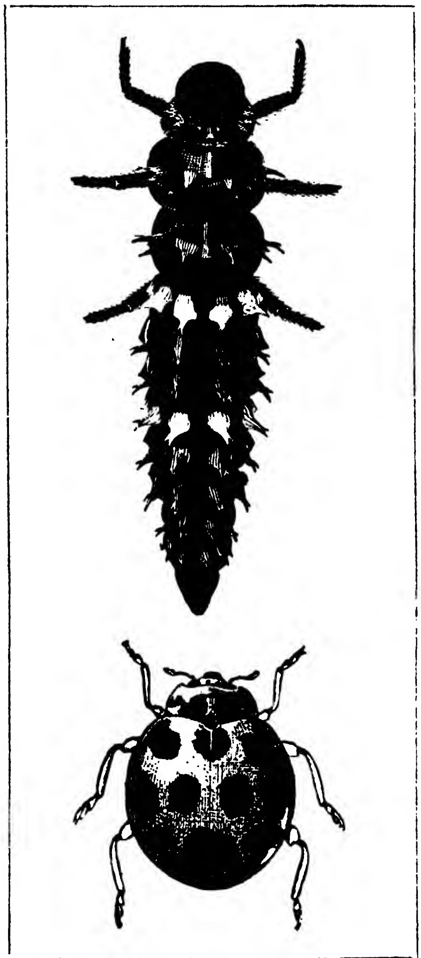
The Steely-Blue Ladybirds (*Orcus* spp.).

The two most frequently seen species of steely-blue ladybirds are *Orcus australasiae* and *O. chalybaeus*. These ladybirds, both in their larval and adult stages, feed upon and destroy scale insects.



The 6-spotted Steely-blue Ladybird.

O. australasiae, which measures about 1/5 inch in length, is of a general bright steely-blue colour, with six rounded orange-coloured spots on the wing covers, and on this account is sometimes known as the "6-spotted" ladybird. In addition to feeding on scale insects it has also been found feeding on "woolly aphids" (*Eriosoma lanigerum*).



The 18-spotted Ladybird and its Larva.

O. chalybaeus is a smaller species with measures about ⅛ inch in length, and is of a uniform bright metallic steel-blue colour.

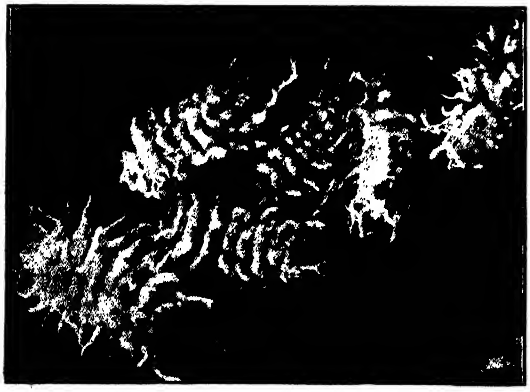
Another larger species of steely-blue ladybird (*O. bilunulatus*) has only two orange-coloured spots on the wing covers. It is also found on scale-infested trees.

Ladybirds Which Destroy Mealy-bugs.

Two species of ladybirds which attack mealy-bugs may be mentioned. These are *Cryptolaemus montrouzieri* and *Rodolia cardinalis*.

The former species (*C. montrouzieri*) in both its larval and adult stage feeds upon and destroys various species of mealy-bugs, including the Pine tree mealy-bug (*Pseudococcus aurilanatus*) and the Long-tailed mealy-bug (*P. adonidum*), which is a pest of many different species of shrubs and garden plants, grape vines, etc.

The adult, which measures about 1/7 inch in length, is black with the head and prothorax, the tips of the wing-covers and the abdomen reddish.



Larvae of the Ladybird which Feeds on the Pine-tree Mealy Bug.

[*After Smith and Armitage.*

The small oval eggs, which are lemon-yellow in colour, are usually laid singly in the cottony egg-sac of the mealy-bug or close to clusters of the mealy-bugs.

The larvæ, when fully-fed measure about 1/3 inch in length. They are elongate and entirely covered with white waxy or mealy material and bear long, white filaments, so that they are often mistaken for large mealy-bugs which they superficially resemble. The filaments, however, are arranged differently, and they are much more active than their prey. The larvæ are considered to be more important that the adults in destroying the mealy-bugs.

Numbers of countries have attempted to introduce this beneficial ladybird, and as far back as 1892 is was successfully and widely established in California, where it fed particularly on various mealy-bugs infesting citrus trees.

Mealy-bugs, especially when mature, are not readily controlled with ordinary sprays, as their protective waxy or mealy covering renders it difficult to wet them, and control becomes more difficult where they are found to be infesting plants with delicate foliage. This species of ladybird predator, therefore, is of particular value in controlling these pests.

The adult of the second species of mealy-bug-feeding ladybird (*Rodolia cardinalis*), which is of variable size, may measure up to ⅛ inch in length. It is usually red with black markings. In some the black markings may be considerably reduced, and in others the red areas may be reduced.

The larva is of a general dark orange-red, but when fully-fed may become covered with a greyish powdery substance; it feeds principally upon the cottony cushion scale (*Icerya purchasi*). This species has also been successfully introduced into various countries to control this mealy-bug.

Other Beneficial Species of Ladybirds.

Many other species of ladybird beetles attack various scales, mealy-bugs and aphids. Amongst these are various black and yellow ladybirds of moderate size which prey upon aphids; others which attack the "gum-tree" scales and various other native scale insects. Some feed on the red scale of citrus and others again feed on mites.

Many species are black or dark-coloured, with indistinct markings, and many are extremely small, and these may pass unnoticed unless searched for.

A Fungus-eating Ladybird.

(*Lepthothea* (*Halyzia*) *galbula*.)

One species of ladybird at least, in this State, feeds upon the spores of mildews (*Oidium* sp.) which develop on many kinds of plants. The adult, which measures about 1/6 inch in length, is light-yellow with black markings.

Although these insects may considerably reduce the number of spores present on the leaves, it is quite possible that they may also assist in the spread of the fungus by flying from plant to plant.

The Grape Vine Scale.

(*Lecanium persicae.*)

THE grape vine scale is a large, elongate-oval scale which, when mature, is dark-brown in colour, and measures about ¼ inch in length. It almost invariably infests the older canes, although immature scales may sometimes be found on the undersurfaces of the leaves late in the season. The scales mature in the late summer and produce large numbers of eggs from which the young hatch. These young pass through the winter as immature scales on the vines.

In addition to the grape vine, it sometimes attacks stone fruits, particularly plums and prunes. Although it is common in vineyards, it seldom causes any serious injury.

Control.

This scale may be controlled by spraying the vines with miscible red oil or white oil emulsion at a dilution of 1 gallon of oil to 40 gallons of water. The spray should be applied during the winter months when the vines are dormant.

Canes Infested with the Grape Vine Scale.

Winter-time Jobs on the Dairy Farm.

WITH the present shortage of labour on dairy farms, the "slack" period during the winter months should be utilised to carry out some of the jobs which cannot be fitted in when the herd is in full milk, but which are nevertheless necessary for efficient operation at that time.

The dairy, cream room and bails should be gone over with a coat of paint, white wash or tar as and where required, and the surroundings attended to. Rails of fences, gates, bail floors, and even drains leading away from the bails and premises may require attention. On many coastal dairy farms where heavy rains often occur, one finds that the gate entrances to the yards, and at times the bail outlets, become quagmires. Such places should be filled slightly higher than ground level. If some heavy stones and gravel are used, a good solid foundation should result when the work has settled down.

Owing to high prices of almost every kind of utensil used in the dairy and the difficulty of obtaining many of them, farmers are advised to pay more attention to their plant.

Milking machines usually have a longer spell than any other portion of the dairy plant in winter time. The rubbers should be thoroughly washed and dried by the methods recommended by the Division of Dairying, Department of Agriculture, and placed in a clean, dry and dark place. All metal parts should be thoroughly washed and dried and kept in a dry spot. If near the coast where the sea air is liable to rust these parts, they should be given a coating of petroleum jelly.

Cans and buckets can be made almost new by the retinning process. Most butter factories will have their suppliers' cans, etc., retinned at a very low cost. This will make for longer life of the articles so treated and also give a brighter appearance to utensils that have, after years of service, become dull.—J. W. G. SMITH, Senior Dairy Instructor.

A TOTAL maize grain yield for the State has been officially forecast at 3,100,000 bushels. This approximates the outturn last season, although the acreage under crop is smaller.

It is estimated that this year's rice yield will approximate 55,000 tons, which will constitute an Australian all-time record. Normal production is in the vicinity of 42,000 tons of paddy rice.

SWINE FEVER.

A Disease that Calls for Drastic Control.*

H. G. BELSCHNER, D.V.Sc., H.D.A., Deputy Chief, Division of Animal Industry.

RECENT outbreaks of swine fever in Western Australia and New South Wales have focussed attention on this serious disease of pigs, and pig breeders and farmers generally will be interested in some information pertaining to the disease. The brief remarks made in this talk will also give them some idea as to the reason for the drastic action taken by the two States to free the country of a disease which causes such great economic loss.

Swine fever has occurred intermittently in Australia during the past thirty-five years, in practically all States, but has always been brought under control and eradicated. Each fresh outbreak has been introduced from overseas, and subsequently spread from State to State.

Western Australia, which had been free of the disease for about thirty years, experienced an outbreak in October, 1942, whilst New South Wales, where the previous outbreak occurred in 1927-28, again recorded the disease on a piggery near Sydney in December, 1942. In both States the disease spread rapidly, but in New South Wales was confined mainly to the County of Cumberland, with the exception, to date, of three isolated outbreaks in country districts. In Western Australia, the total number of pigs destroyed is between 12,000 and 13,000, whilst in New South Wales the number is slightly less than 10,000.

The strict quarantine measures imposed in both States and the employment of prompt measures of control by the slaughter of all infected and in-contact pigs and disinfection of premises, have been effective in checking the disease, and it is confidently anticipated will be the means eventually of stamping it out, as has been done in previous outbreaks in Australia.

Swine fever is very widely spread throughout the world and causes great losses in all European countries, America and Great Britain. In America the disease is known as "Hog Cholera," and it is always referred to by that name in the United States.

Cause of the Disease.

Swine fever is a highly contagious disease, caused by a virus, and is entirely peculiar to the pig. Not only is it never seen in any other animal, naturally, but all attempts to transmit it experimentally have failed. Man is not affected, and cannot contract the disease, even if pork infected with swine fever is consumed.

The virus which causes swine fever cannot be seen under the highest powered microscope, and for this reason it is termed "ultra-microscopic." It is so minute that it will pass through the pores of the finest bacteriological filter.

The length of time during which the virus retains its virulence has an important bearing in the spread and control of the disease. As in other diseases of a similar type, the virulence of the virus varies in different outbreaks.

Pigs Stacked Ready for Burning.
During the recent outbreak of swine fever.

* Notes of a recent broadcast over national stations.

It may remain alive for a considerable period in an infected piggery in dark, damp situations. Direct sunlight rapidly destroys it.

It has been shown experimentally that the virus may remain alive for long periods in the bone marrow, muscle and skin of cured carcases of pigs killed in the early stages of the disease, and before the appearance of symptoms. The practical importance of this is very great, as it indicates that the spread of the disease can be maintained through feeding back to pigs, scraps of bacon or pork from carcases of pigs killed when infected and not yet showing any symptoms, such scraps being contained in garbage.

Manner of Spread of the Disease.

How is the disease spread? The blood of pigs suffering from swine fever contains a large amount of the infective agent, and as the blood flows through all the organs and tissues, these also contain it. All the discharges contain the virus to a greater or lesser extent, and discharges from the intestines are particularly dangerous.

Healthy pigs are readily infected by swallowing infective material, by association with diseased animals and from infected premises, litter, utensils, etc. Infected material can be carried on the boots or clothing of persons from place to place. As explained previously, garbage containing scraps of pork or bacon from infected pigs can become a fruitful source of dissemination of the disease. *All garbage should be thoroughly boiled before being fed to pigs.*

Symptoms.

In every contagious disease there is an interval between the time of infection and the appearance of symptoms of the disease. This is called the incubation period. The period of incubation in swine fever may be from three days to three weeks.

The symptoms vary according to the way the disease shows itself in the acute, subacute or chronic form. An outbreak may be ushered in with cases of an acute type, the most susceptible animals being killed off, followed by the subacute and chronic forms. On the other hand, an outbreak may begin and end with acute cases. It depends to some extent on the virulence of the virus. Young pigs are more severely and rapidly attacked than older pigs.

In acute cases the animals refuse food, shiver and stagger and may lie in a corner of the stye. There is frequently a catarrhal discharge from the eyes; the eyelids become glued together; the temperature is high, up to 106 or 108 deg. Fahr.; difficult respiration is common and diarrhoea may be present. There is great prostration and pigs affected with this type of the disease may die in one or two days.

In sub-acute cases the more typical clinical symptoms are seen. The pigs go off their food, lie about in dark places and are not easily roused. Thirst indicates a temperature, and there may be attempts to vomit. Discoloration of the ears, abdomen and thighs in the form of red blotching—more noticeable on white pigs—may or may not appear. When the lungs are affected, hurried breathing and cough will be present. Constipation may be followed by profuse diarrhoea, and there may be a discharge from the nose. The pigs gradually weaken, and when made to move, stagger about in a drunken fashion. Death may not take place for from one to three weeks, but in some cases the animal may make a partial recovery and the case passes to the chronic type of the disease.

In the chronic form, the symptoms are not so well marked. The pigs have a hard, stunted, unthrifty look, and the skin is harsh and dry. Other symptoms as described in the acute and sub-acute forms may be observed. Animals so affected may live up to eight weeks or longer. Such cases are very dangerous, as healthy animals may contract the disease from them in a more virulent form.

Many of the symptoms described are those of other diseases of pigs, so that no one definite train of symptoms can be considered as especially indicative of swine fever. Pig owners might suspect swine fever under the following circumstances:—

(1) When a number of pigs are dying.

(2) When a number of pigs are sick or unthrifty.

(3) When periodic deaths are occurring, even if the remaining pigs appear healthy.

(4) When large numbers of suckling or newly weaned pigs are dying, even if the older animals appear to be healthy.

All these circumstances are, of course, more significant when swine fever is known to be present in the country. The fact that

(*Continued on page* 296.)

Pasture Stability in the Western Division.

Causes of Deterioration and Methods of Reclamation.

TO secure reliable information on the vexed question of the stability of the pastures of the Western Division of the State, and the extent, if any, of the deterioration that has occurred in the feeding value of these pastures, Mr. E. A. Elliott, Sheep and Wool Expert of the Department, has made a number of visits during the last few months to various parts of this area, and conferred with Stock Inspectors, landholders and others qualified to express an opinion.

As a result he has formed the opinion that the stability of the Western Division is almost entirely a matter of careful management. Given an area of sufficient size—and this will, of course, vary according to the particular part of the Division—and sufficient finance to subdivide into enough paddocks, provide water in each, purchase stock and stand a bad season, a settler should have no cause for concern. Having sufficient water will allow all the country to be utilised if needed, and the areas round the water will not be unduly trodden out.

A reasonable carrying capacity must be decided on, and the lessee prevented from stocking above that capacity at any time, no matter how good the conditions are. All surplus sheep should be disposed of yearly at a definite age, and the area should be sufficient to allow at least some portion to be free from stock each year so that seeding of the pastures will occur.

The questions which came up for discussion were:—

Had the pastures over a period of years suffered any deterioration, and, if so, to what extent? What were the generally accepted reasons for such deterioration, and what could be done to bring back the carrying capacity?

In the discussion of these questions consideration was given to such matters as effect of the rabbit, the location of the water supply, and the value and practicability of spelling areas of the country.

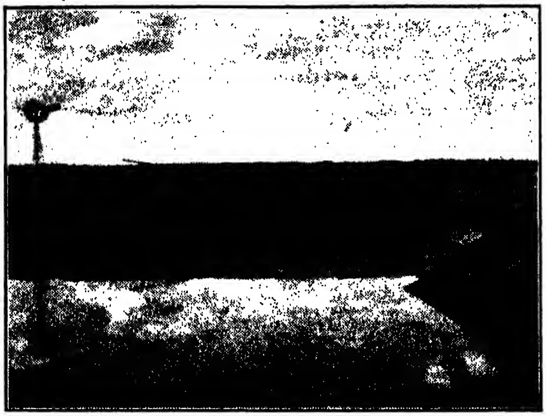
Has Deterioration Occurred?

Many differences of opinion were expressed on this point. It is to be remembered that the early explorers of this country recorded that areas of loose sand and sand hills were crossed. These exist to-day and the sand hills still run in the same general direction. No information is available as to whether they are larger or smaller, and those present are certainly not

Typical Mulga Country of the Western Division.

of recent origin, judging by the growth of mulga, nealea and other shrubs covering them. The explorers also spoke of extensive clay pans or scalded plains; these are found to-day in some areas, and as far as can be ascertained no great increase in size is occurring.

However, there certainly are signs of deterioration in many parts of the Western Division. It can be seen in the dead trees and shrubs, the scarcity of many nutritious grasses and the preponderance of innutritious growths. In the light and sandy types of soil the killing of timber and shrubs means more opportunity for wind action and consequent movement of the soil.



The Clare Pastures Protection Tank.
Capacity, 25,000 cubic yards.

Perhaps the greatest apparent deterioration of modern origin can be seen in the unwise use of watering places, shown by excessive erosion adjacent to the tank or supply, and extending in some cases for miles from the location of the water. An example of this deterioration is plainly seen along portions of the northern bank of the Barwon above Brewarrina, where properties are poorly watered at the back, making it necessary for the stock to water at the river all the time.

Damage Caused by Rabbits.

It is claimed by some that the deterioration began first with the advent of the rabbit, which, in addition to killing out succulent grasses, had by ringbarking and digging for the roots in search of moisture destroyed enormous quantities of protective cover, salt bush, and similar shrubs and small edible trees. This allowed the wind to act more freely on the surface soil and so caused increased erosion.

In various parts of the Division, areas of open wind swept country were seen which, prior to the advent of the rabbit, had been covered with cotton bush and similar shrubs. The shrub growth destroyed by the rabbit will not come again.

The rabbit is still present in some areas, while in others one is rarely seen. With good seasons they may be expected to increase and a recurrence of similar damage to that done earlier may be expected.

In discussing the rabbit the great difficulty of combating this pest in the large areas of the Western Division was made evident. The use of the poison cart or trapping is out of the question; possibly on river frontages some good may result, but not in the open country. Netting as a method of control is of little value on country subject to wind erosion, as in a few days the fence can be rendered useless. The only practicable method is by poisoning of the drinking water, and this can only be done when all surface water (except the tanks) has dried up. By this time the feed is dry and the bulk of the harm the rabbits can do has already been done. However, great numbers of rabbits have been destroyed in this way during previous invasions.

Shifting Sand may Cover Fences, thus Creating Many Difficulties.

Overstocking.

Overstocking with sheep on the naturally loose soil has also been responsible for many localised cases of deterioration. A run of good seasons encouraged heavy stocking in earlier years, and this in some cases did probably as much damage as the rabbit. It is claimed also that a definite

cause of deterioration is allotting areas which are too small. When feed is present, sheep are crowded on while feed and water last in an effort to make as much as possible from the property.

The Influence of Water Supply.

In the Western Division there are four methods of supplying water, namely: (1) Running streams or pools along water-courses; (2) artesian sources; (3) sub-artesian sources; (4) excavated tanks or dams.

It is evident that deterioration has resulted from improper and uneconomic use of water supplies; it is usually seen following excessive stocking of country adjacent to the supplies because of insufficient watering places, taking the form of wind erosion and scouring out of sheep tracks during rain storms. Large numbers of stock watering at the one spot for weeks and months do enormous damage to the approaches to the water, no matter what type of supply it is. If it is a surface tank there is considerable silting and reduction in the holding capacity, and along river frontages much erosion has been caused in windy weather, as at Brewarrina, and has, in places, resulted in silting up of the river bed, making the supply less permanent.

(To be continued.)

Wartime Rabbit Control—Use of Poison Necessary.

THE rabbit problem is at present creating much concern amongst landholders. It is, of course, generally recognised that the best method of dealing with the rabbit is the erection and maintenance of rabbit-proof fences and the extermination of the rabbits within the netted area by such well known methods as digging out, ploughing out or the destruction of cover. The difficulty of securing wire and netting and the shortage of manpower, however, appear to be having an adverse influence on the use of these methods.

This situation has increasingly turned attention to some of the other methods of dealing with the rabbit, but here again lack of supply has, to some extent, interfered with work.

Fumigation with calcium cyanide or carbon bisulphide is used with good effect and supplies of fumigating material are available.

Poisoning has always been one of the methods employed, and although it has drawbacks which do not apply to other ways of destroying rabbits, the present situation regarding material and man-power may make it necessary to use this method. The two poisons commonly used are phosphorus and strychnine. Strychnine is undoubtedly favoured most in this State, but, unfortunately, supplies are very limited at the moment, although the question of arranging for further importations is receiving close attention. The other poison, phosphorus, though unpleasant stuff, to handle, is evidently more readily available.

Details of the methods of using phosphorus poison are given in the pamphlet "Rabbit Destruction," which may be obtained from the Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney, but, as pointed out in the pamphlet, there are on the market various commercial poison mixtures containing phosphorus ready made for dissolving and mixing with pollard.—MAX HENRY, Chief, Division of Animal Industry.

"Exotic Infectious Diseases—Their Recognition and Diagnosis."

RAPID and adequate action in stamping out disease depends upon prompt recognition, and although the control of epizootic diseases primarily concerns the veterinary officers of the Commonwealth and State Departments, every veterinary graduate in Australia should be constantly on the watch, as no one can forecast when and where a disease may appear.

At a conference of Commonwealth and State veterinarians held in Canberra in May, 1941, it was recommended that a plan for the dissemination of information on epizootic diseases not present in Australia, should be prepared, and that this information, when ready, should be distributed to all veterinary graduates in Australia.

At a further conference, held in Canberra in January, 1943, it was decided to ask the Australian Veterinary Association to undertake the printing and distribution of this information, and this request was agreed to by the annual general meeting held in Sydney on 23rd January, 1943.

As a result of these decisions every member of the Australian Veterinary Association has now been supplied with a bulletin containing the latest information on the diagnosis of nine of the diseases, the introduction of which is most to be feared.

Rabies, no doubt on account of the danger to man, is dealt with at some length; the others derive their chief importance from the economic aspect. All are capable of doing immense harm to our livestock industries.

Perusal of this publication emphasises again the need for a full-staffed and efficient veterinary quarantine service.—MAX HENRY, Chief, Division of Animal Industry.

A Hive Reduced in Size for Winter Comfort.

Bee-keeping Hints.

W. A. GOODACRE, Senior Apiary Instructor.

IN describing the difficulties and risks associated with the working of a winter honey flow it is not the intention to discourage bee-farmers from attempitng this work—because it is believed that honey production during winter will play an increasingly important part in the extension of the industry in this State—but rather is it desired to stress the importance of learning the technique of apiary management during winter flows in order to avoid the serious losses which may occur when hasty and full scale entry is made into this field without such knowledge and without a careful study of all the factors involved.

At this time of the year—when the colonies have already settled in a winter cluster and have reduced brood-rearing—any bee-farmer moving bees on to a winter flow is surely looking for trouble. If such a move be made, it is most likely that within eight to ten weeks, although the hives may be well filled with honey, the colonies will be hopelessly weakened in population. The bees have no reasonable chance of re-establishing a brood-nest under such trying conditions, and the working force, which soon wears itself out doing strenuous field work, will not be replaced from the small amount of brood which may be raised; few colonies would have a chance of surviving such an ordeal.

The Flow at Dubbo and Peak Hill.

The Mugga ironbark (*Eucalyptus sideroxylon*), a winter-flowering species and a good honey producer, came into blossom earlier than usual in some parts of the country, and a few bee-farmers who moved into the warmer country in the Dubbo and Peak Hill districts have secured several good extractions from the hives. It appears doubtful, however, whether it will be worth while for them to take the risk of remaining on the flow, as the condition of the colonies has recently been deteriorating fairly rapidly, and there is serious risk of heavy losses if the colonies are not moved to country which will ensure a spell from hard field work under trying conditions, and where the bees may have a chance to recuperate. Shortage of pollen following the dry autumn conditions has been responsible to a large extent for the deterioration of colony strength. Little, if any, pollen is provided by Mugga, and the dry conditions affected the other species.

Some Risk This Season.

The honey produced from the Mugga ironbark is of choice quality and specially good for candying purposes. There is therefore an added incentive for the young bee-

Method of Li ting Heavy Super.
In this way the muscular effort is distributed throughout the body and is not concentrated in the arm and fingers.

farmer to move during winter to secure an extraction or two from the species. In many cases he may not be well acquainted with the serious risk entailed, such as the possibility of losing practically all his colonies. The deceiving factor about these winter-flows, either from Mugga ironbark or from White box, is that on some occasions bees hold their strength very well, and may even build up when mild winter conditions prevail and ample supplies of pollen are available.

However, this season appears to be one in which some risk may be attached to working a winter flow, and the only plan by which an extraction or two of Mugga honey may be secured with a margin of safety is to winter the bees in good order on the home sites, or move to a warm district where the colonies will build up well during the early spring. They may then be moved into the late-flowering Mugga country to catch the tail-end of the flow. The species usually flowers later in the country between Mudgee and Coonabarabran than in the Dubbo-Peak Hill, Cootamundra and Young country.

Selection of the Apiary Site is Important.

The importance of selecting a well-sheltered and sunny site for the apiary when working a winter honey-flow cannot be over-emphasised. It was observed in the Dubbo district recently that the bees in hives in a corner of an apiary, which was shaded until 10 a.m. each day, were less progressive than those securing a maximum of the sun's rays. The colonies in hives out in the sun were carrying a larger quantity of brood, and were in better heart than those in the shade; this is a very important factor when so much depends on maintaining the strength and vitality of the colonies.

Heavy Super Replaced on a Hive Slightly Cornerwise.
The super may be lifted into this position without pause with minimum damage to bees, and after the bees have been edged off the super body, very little effort is required to twist it into the correct position.

Bees may suffer severely during a winter flow where there is a shortage of pollen. The Mugga does not provide any useful supply, and the successful working of the

species depends on some other plant flowering at the same time to provide sufficient of this nitrogenous food to enable the colonies to maintain brood-rearing.

Apiary Management During a Winter Flow.

During the working of a winter flow it is almost invariably necessary to operate much smaller hives than may be used during a flow in the warmer months of the year. Bees are always inclined to store the honey low down in the hive, even to the extent of congesting the small brood-nest. Owing to the cool conditions the bees have to cluster together to keep up a reasonable temperature, and the tendency is to keep honey-storage work within the sphere of the cluster. Outside this range it would be difficult to give proper attention to the processing of the raw nectar being brought in from the fields.

During apiary inspection work, it has been observed that, on the first visit to a bee-farmer working a Mugga flow, a couple of supers are on the hives; later on a reduction to one super is made, and on occasions the hive has been reduced to the brood chamber only. At this extreme stage it becomes a matter of extracting a comb or two from about the brood nest to allow of the bees carrying on sufficient brood-rearing to hold together. A great deal of experience in handling winter flows is required before the risk of working down to the limit mentioned may be accepted—and the indications are that the risk this winter will be greater than usual.

Extracting Honey in Winter.

The bee-farmer who makes a practice of following winter-flows usually makes provision for a hot room in his honey-house, in which the combs moved from the hives may be warmed up before being extracted. Honey in the combs soon becomes cool after being removed from the hive, and may become very difficult to extract. The combs are liable to damage owing to the strain imposed if put through the extractor when the honey in them is cool and heavy bodied, hence the need to reduce the viscosity of the honey in a hot room.

As only small hives are in operation at this time, a plentiful supply of combs should be available to replace immediately the full ones removed from the hives, and where a hot-room to store the full combs is available the bee-farmer is in no immediate hurry to proceed with extraction work.

Where a hot-room is not available, however, it is necessary to extract the honey immediately it is removed from the hives, although this presents a rather troublesome job at times. The migratory man working in a large way, and a long distance from his home-plant, will require to have power extractors available, and these are helpful in removing dense honey.

Handling Supers.

Suggestions for Conserving Energy.

THE bee-farmer is faced with the possibility of heavy honey production in the season ahead and a shortage of experienced assistance to deal with it. From the commencement of active operations in hive manipulation, therefore, he will need to apply such methods as will conserve his energy in every possible way. Many of the usual methods of removing and replacing heavy supers on the hive impose undue strain on the muscles of the body and limbs, and this may be avoided by the adoption of other means.

When removing a heavy super, for instance, it is the usual practice to grasp the front hand-hold with one hand, and with the other, to lever up the super with the hive tool. This imposes a very heavy strain on the fingers and muscles of the arm employed to lift up the super by the hand-hold grip, particularly when the sets of super-frames are stuck together with burr-comb. The following method is suggested: stand at the right-hand side of the hive towards the front, grasp the left front corner of the super with the left hand, then press the hip, upper leg or knee of the left leg as the case may be, according to the size of the hive, the knee being bent slightly, against the opposite side of the super. By this means the lifting and holding of the super whilst frames attached by burr-comb are being eased apart, is assisted by the distribution of muscular effort over the whole body. (See accompanying illustration.)

When replacing heavy supers it is desirable that the bee-keeper be relieved of the weight at the earliest possible moment. There is often a tendency to hold

(Continued on page 296.)

Copper-dusted Wheat as a Supplementary Feed for Sheep.

J. C. KEAST, B.V.Sc., Pastures Protection Board Veterinary Research Officer, Glenfield Veterinary Research Station.

FARMERS who have on hand quantities of wheat treated with proprietary copper dusts for the prevention of bunt, have approached the Department for advice as to whether this treatment of the wheat makes the grain dangerous as food for sheep. A small feeding trial was recently conducted at Glenfield in order to determine this point. It was found that no serious ill effects resulted, and that the grain was just as nutritious as untreated wheat.

Eighteen crossbred sheep, approximately sixteen months old, and accustomed to trough feeding, were selected and divided according to weight and sex into three comparable groups each containing three ewes and three wethers. The groups of sheep were penned separately and fed daily for four months on rations which were expected to maintain body weight. The feed for each group was placed in a wooden trough, and the actual daily ration provided for each sheep was:—

Group 1.—¾ lb. wheaten chaff and ½ lb. wheat.

Group 2.—¾ lb. wheaten chaff and ½ lb. dusted wheat.

Group 3.—¾ lb. wheaten chaff and ½ lb. dusted wheat, plus 1 per cent. calcium carbonate.

The third group was included because it was thought that the calcium carbonate would remedy any possible ill-effects which might result during the course of the trial from the feeding of calcium-deficient cereals, and also because the calcium carbonate might possibly reduce copper absorption.

The dusted wheat was prepared by mixing 2 oz. of a proprietary copper dust with 60 lb. wheat. This was sufficient for Groups 2 and 3 and for ten days, so that freshly-dusted wheat was prepared every ten days. (The actual recommendation for this dust is 1½ oz. to the bushel of wheat.) Chemical analysis of the dust showed it to be a mixture of oxychlorides of copper.

The calcium carbonate was supplied in the form of prepared chalk, except for the last three weeks, when ground limestone was substituted. It was mixed daily with the ration for sheep in Group 3.

The treated wheat was apparently not distasteful to the sheep, as after the first few days, all feed made available to the sheep was readily consumed.

All the sheep were weighed each fortnight. During the course of the trial, three sheep in Group 3 and one sheep in Group 2 scoured slightly for two to three days, and one sheep in Group 3 scoured for six days. The scouring resulted in these sheep losing weight and this slightly reduced the mean live weights of the respective groups during those periods. Apart from this scouring, no other ill-effects were observed during the course of the trial.

Mean Live Weights of Groups.

	Group 1.	Group 2.	Group 3.
	lb.	lb.	lb.
23 Nov., 1942	65·6	66·1	66·0
*8 Dec., 1942	64·9	65·3	64·6
†8 Dec., 1942	56·9	58·1	57·0
22 Dec., 1942	58·5	60·3	59·0
5 Jan., 1943	57·5	59·5	58·5
19 Jan., 1943	59·0	59·5	59·9
2 Feb., 1943	61·0	61·5	61·0
16 Feb., 1943	60·3	62·1	61·1
2 Mar., 1943	60·5	61·5	59·1
16 Mar., 1943	61·5	62·1	60·9
30 Mar., 1943	60·6	60·9	59·3

* Weight before shearing. † Weight after shearing.

The mean weights of the three groups, as shown in the accompanying table, remained similar throughout the trial, indicating that the feeding of wheat treated with copper dust to sheep at the rate of ½ lb. per head daily for a period of four months, had no serious ill-effects on the animals, and that it was just as valuable from the nutritional aspect as untreated wheat. The value of 1 per cent. calcium carbonate as a supplement to cereal feeding of sheep was not confirmed by this short trial.

FEEDS and FEEDING NOTES.

Seasonal Feeding Troubles.

Toxaemia of Pregnancy.

WHERE ewes are heavy in lamb, or lambing, and there are feed shortages, losses from toxaemia of pregnancy may be experienced. These losses may be minimised by improving the feed supply, especially during the last few weeks before lambing.

Where rough feed is available in the paddock, 2 to 8 oz. of wheat or barley, or 3 to 10 oz. of oats, with ½ to 1 oz. of meat meal may be fed in troughs or self-feeders. Where the paddocks are bare, about 1 lb. of cereal, or preferably lucerne hay may be fed in addition. This may be considered too expensive, but a few ewes saved can purchase quite a lot of supplementary feed.

Internal Parasites in Young Sheep.

In districts where feed has gone off rapidly with the approach of cold weather, symptoms of worm infestation may be seen,

Current Feeding Costs.

COST of roughages has risen since last month and once again the importance of home-produced roughage is stressed. As protein concentrates are scarce, the best way to conserve protein in fodder is to make silage, especially from legumes such as lucerne or clover, combined with cereals such as wheat or oats.

Feed.	Starch Unit Value per 100 lb.	Protein Unit Value per 100 lb.	Cost.	Cost per Starch Unit.	Cost per Protein Unit.	Remarks.
			ROUGHAGES.			
Lucerne hay or chaff ...	35–45	10	£9 10s.–£11 long ton ...	2·6d.–3d.	...	Roughage is still the most expensive part of the ration. Make maximum use of home-produced pasture, hay, silage, or green crops. Make provision for future supplies *now*.
Oaten and wheaten hay	33	3	£8 10s. long ton ...	2·8d.–3·3d.	...	
Oaten and wheaten chaff	40	3	£8 10s.–£9 long ton ...	2·3d.–2·4d.	...	
Oaten straw	20	0·6	£7–£7 10s. long ton ...	4d.	...	
			STARCHY CONCENTRATES.			
Maize	78	8	6s. bushel	1·6d.	...	Too expensive. Will pay to crush own grain.
Maizemeal	78	8	£12–£13 short ton ...	1·9d.	...	
Wheat	72	8	3s. 3d. bushel (6,000 bushel lots). 3s. 3⅜d. bushel (truck lots)	1d.	...	Cheapest sources of starch available. Best crush own grain if possible. Coarse crushing—cracking—gives best results.
		8	Bagged, 3d. extra.			
Wheatmeal	72	7	£6 10s.–£7 5s. short ton	1·2d.	...	
Barley	71	7	3s. bushel	1d.	...	
Barley meal	71	7	£7 10s. short ton ...	1·3d.	...	
Oats	62	8	2s. 7½d. bushel (40 lb.)...	1·4d.	...	Not as good buying as wheat or barley.
Crushed oats	62	8	3s. 6d.–3s. 9d. per 40 lb.	1·7d.–1·8d.	...	
Pollard	66	10	£6 short ton	1·1d.	...	Supplies very short. Substitute wheat or barley-meal where possible.
Bran	55	10	£6 short ton	1·3d.	...	
			PROTEIN CONCENTRATES.			
Meat Meal (60 per cent. crude protein).	80	55	£10 10s. short ton ...	...	2·3d.	Supplies fair.
Linseed meal	72	25	£9 10s.–£10 short ton...	1·6d.–1·7d.	4·5d.–5d.	Supplies fair but expensive.
Peanut meal	78	43	£6 10s. short ton ...	1·1d.	1·8d.	Limited stocks available.
Cocoanut meal ...	76	15	£7 per short ton ...	1·1d.	5·1d.	Supplies available.
Maize gluten	78	20	£9 per short ton ...	1·4d.	5·4d.	Supplies available.

Long ton—2,240 lb. Short ton—2,000 lb.

MINERAL SUPPLEMENTS.

Mineral.	*Cost.*	*Supplies.*
Ground calcium carbonate (limestone)—a calcium supplement.	30s. 6d. per short ton in bags. (Truck lots.)	Supplies available.
Bone meal (calcium and phosphorus supplement).	£14 10s. per short ton.	Supplies moderate.
Bone flour (calcium and phosphorus supplement).	£11 15s. per short ton. (Less 15 per cent.)	Supplies available.
Shell grit	30s. per ton, bulk.	Supplies available.

especially in weaners. Owing to shortage of essential drugs, treatment by drenching is becoming more difficult. Therefore full attention should be paid to keeping the best feed up to young sheep and lambing ewes. Rotational grazing, turning young sheep on to clean paddocks, and crossweaning should be practised as much as possible.

Decreasing Milk Yields.

With milk rationing a prominent feature in Sydney, herds being cut down and yields decreasing, it is becoming more important than ever to see that the cows that are being milked are milking to capacity. It takes but little longer to milk a 3-gallon cow than a 1-gallon cow, but heavy producing cows require heavy feeding. The policy for the farmer who is shorthanded, but wishes to maintain yields, should be to run as many cows as he can handle, and to feed these for maximum production.

Working Draught Horses.

Fuel shortages are resulting in draught horses becoming of increasing importance. Like tractors, horses require proper fuel if they are to work efficiently. Suitable rations for working draught horses are:—

	No 1.	No. 2.	No. 3.	No. 4.
	lb.	lb.	lb.	lb.
Wheaten or oaten chaff	25	10	20	15
Oats	10	10	10	10
Bran	...	4	4	...
Lucerne hay	...	10	...	10

Boiling Garbage for Pigs.

Many piggeries formerly affected with swine fever and which have been thoroughly disinfected and spelled are now being permitted to restock. In view of the serious losses experienced this year from swine fever, following the feeding of infected garbage, the necessity for thorough boiling of garbage cannot be over-emphasised. Any relaxation of this precaution is likely to be followed by serious results.

Will Victory Bring Peace to the Pacific?

MORE RADIO GROUP DISCUSSIONS.

IN continuation of the series of radio discussions on subjects related to post-war reconstruction, which is being presented for the use of radio listening groups by the Australian Broadcasting Commission, a programme entitled, "Will Victory Bring Peace to the Pacific ? " will be continued during June.

On the Tuesday of each week a problem will be presented by an authority on the subject over the National Programme (2FC, 3AR, 4QG, 5AN, etc.), and on the following Monday a discussion will be staged with the original speaker on the Alternative Programme (2BL, 3LO, 4QR, 5CL, etc.).

As usual copies of the scripts and other literature will be made available to each listening group free of charge on application to the Organiser of Listening Groups, Box 487AA, G.P.O., Sydney, who invites group leaders to send to him comments, criticisms and requests for further information.

The Programme for June.

The programme for the months of May and June is as follows:

Tuesdays—National Programme.

1st June: "What Can We Do With Japan?" by Dr. W. G. K. Duncan.

8th June: "A Strong China Needed for a Strong Peace," by Dr. W. G. K. Duncan.

15th June: "Smoke Stacks in the Orient—The Pacific and the Industrial Revolution," by Mr. H. D. Black.

22nd June: "Australia—Her Role as a Co-operating Partner," by Mr. H. D. Black.

29th June: "The United States—Guardian or Governor?" by Professor Ian Clunies-Ross.

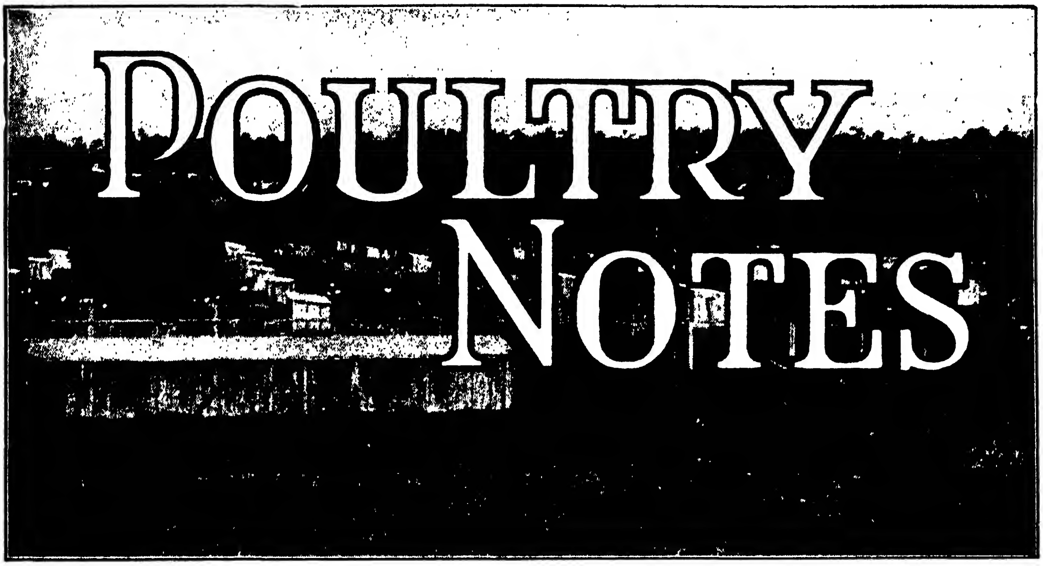
Following Mondays—Alternate Programme.

Discussion of previous Monday's subject.

WAR GOSSIP IS DANGEROUS.

Enemy agents are vitally interested in Australia's War Effort.

Don't assist them by discussing what you know about the manufacture and storage of munitions.



Management of the Chickens.

REARING operations will again commence during this month, and every effort should be made to ensure that the chickens have the best of conditions in order that they will develop into robust and profitable birds.

The handling of the chickens during the first few weeks of their lives largely determines whether they ultimately prove profitable, either as layers or table birds. In view of the importance of this part of poultry farming operations, it is difficult to understand why numerous poultry farmers put up with unsatisfactory equipment year after year, and sustain losses far in excess of what might reasonably be expected.

The tendency is to blame diseases for undue losses, but in many instances the rearing methods are responsible for a lowering of resistance resulting in a greater susceptibility to disease. This wastage in chicken life contributes towards increasing the cost of production and results in a lowering of returns, due to the fact that where a high rate of mortality occurs through unsatisfactory management or rearing methods, many of the surviving chickens are unthrifty and do not develop into profitable birds.

With suitable rearing equipment and proper care, the losses among chickens up to six months of age should not exceed 10

per cent., but on the average farm the mortality rate is much higher, and where primitive equipment is used it is often as high as 50 per cent. or more. On farms where such heavy losses occur it is impossible to build up a highly productive flock and, moreover, when the chickens are badly reared the mortality among the birds when fully grown can be expected to be high.

Thus the importance of suitable brooding and rearing equipment should be apparent, and while under present conditions it might not be possible, in many cases, to carry out necessary improvements, or install new plant, every endeavour should be made to do so where chicken losses are abnormal each year and can be attributed to this cause.

Rotting in Eggs.

Results of Five Years' Investigations.*

OVER a period of five years, experiments and research work have been carried out by the Council for Scientific and Industrial Research, to determine the causes of deterioration in egg quality, particularly in regard to wastage in eggs after being held in cold storage for any appreciable length of time; as for example, between the time of packing the eggs for export and their ultimate distribution in the United Kingdom, which involved cold storage prior to shipment, and again on the vessel during the voyage.

This investigation programme was arranged and agreed to after discussion in 1938 between representatives of the C.S. & I.R., the Department of Commerce, and and the Egg Producers' Council.

The main reason for the decision was that reports from the United Kingdom on Australian eggs there, had disclosed outturns which at times were very "patchy," and showed some deterioration compared with the immediately preceding years. While the great bulk of Australian shipments were of excellent quality, there were exceptions—and occasionally, serious exceptions—and instances occurred of surprisingly poor outturn of portions of consignments from Australian packers who enjoyed a reputation for careful selection and packing, and who were constantly endeavouring to safeguard their own reputations and future business in the United Kingdom. This development coincided closely with the introduction of the egg washing machine as a labour-saving device on poultry farms; and as there was ample evidence that this quality trouble still arose in instances when the cause could not be ascribed to careless selection or packing, suspicion fell upon the use—or misuse—of washing machines. This was further strengthened by London reports that some continental countries had already ascribed quality troubles to the use of egg washing machines.

The need for research on this important matter has also been apparent since the cessation, due to war conditions, of shipments of shell eggs overseas, as an increasing percentage of wastage has been in evidence in recent years in respect of eggs stored in Australia for winter needs, and also eggs stored awaiting drying into powder.

These losses have occurred in the face of improved methods of handling in recent years, and generally more scientific and accurate control of cold store conditions.

A clear understanding of how rotting occurs in eggs will be most helpful in appreciating the conclusions and recommendations later in this report. The rotting is caused in every instance by bacteria. There are several types of bacteria which produce rotting—causing what are usually termed "green whites," "red rots," black rots," etc. —and there are also many harmless types of bacteria. Every egg has several types of bacteria on the shell; but the damage is done when the harmful organisms penetrate to the inside, and by reason of favourable conditions, grow and multiply there, and thus produce "rots."

The Experiments.

In these experiments it has been essential to reproduce the conditions under which

* Extracts from summary prepared by Mr. C. W. Sayers Secretary Egg Producers' Council, based on the report furnished on these investigations by the Council for Scientific and Industrial Research.

rotting has taken place in commercially stored eggs; and therefore it has been necessary to cold store eggs for eight to nine weeks, after various treatments, before making the detailed examinations.

The experiments have been conducted in all mainland States, thus spreading the work and enabling types of experiments to be carried out simultaneously without overloading the personnel available at any one point. This has also enabled results from one particular type of experiment to be checked up by repeating it in another State, where some conditions may be different. Several dozen large experiments were completed and several thousands of dozens of eggs were examined individually.

If eggs received at packing floors are already bacterially affected, it is impossible to stop the process of deterioration, although the eggs may appear sound and pass the candling test. The experiments were therefore all designed to locate the original source of bacterial infection, which is the only point at which any marked improvement can be effected. The egg is provided with a natural resistance to infection from the outside, but once this has been broken down and bacteria have penetrated the shell, the damage is done and cannot be retracted.

The consuming public, whether in Australia or overseas, naturally prefers clean and attractive looking eggs, and is willing to pay for them, and export regulations require eggs to be clean shelled. These factors encouraged the introduction and wide use of various types of cleaning machines on farms, especially as the percentage of eggs sufficiently clean, when picked up, to pass the export test is surprisingly small, and some cleaning is necessary to enable the spring surplus to be made acceptable for export.

These cleaning machines themselves require regular attention to maintain them in a reasonable state of cleanliness. When eggs were cleaned on machines which obviously had been neglected, the wastage in stored eggs was always increased. On the other hand, when machines which appeared clean were used the results were not always dependable. It was found that the reason for this was that even though machines appeared clean they often harboured large numbers of rot-producing bacteria. One such machine in a good clean condition gave over 80 per cent. rots in eggs cleaned on the machine. Other machines which were clean did not increase wastage. However, in the absence of special bacteriological examinations it is not possible to distinguish the one machine from the other.

We now pass to the conclusions reached, all of which are commended to the most careful attention of producers. It is worth while again reminding poultry farmers that these conclusions were only reached after five years' work, and careful checking of initial results until they could be stated as scientifically proved beyond all reasonable doubt.

What the Experiments Have Shown.

The following conclusions are set out in the final report:—

Work in previous years had clearly incriminated certain cleaning machines as one of the major factors determining wastage in stored eggs. This year, attempts were made to discover the means by which infection is introduced, and to devise suitable measures to control wastage resulting from machine cleaning.

Consideration of the results of the experiments conducted this year, together with those obtained in previous years, enables the following general conclusions to be made:—

Cleaning machines, as they are normally found on farms, are the important source of the rot-producing bacteria which cause wastage. While these bacteria may originate on the shells of dirty eggs, they frequently find favourable conditions for multiplication on cleaning machines. Subsequently, during cleaning, they may be transferred back to other eggs in a manner which causes the internal infection of those eggs.

During the machine cleaning, the bacteria penetrate into or through the shells, to situations where they are protected substantially from external influences. This was shown very convincingly by experiments in which disinfectant dips, after machine cleaning, did not materially reduce the rate of rotting in the machine cleaned eggs. The conclusion was also supported by other experiments in which cleaning methods which caused little or no wastage by themselves, were unable to reduce the wastage caused by a previous cleaning treatment.

All the evidence of experiments is in agreement that cleaning machines have a harmful effect upon keeping quality of eggs, simply because the machines are reservoirs of infection, but the possibility cannot be excluded that one type of machine may have a greater capacity for transferring the harmful effect to the eggs than the other.

Experiments have proved that it is difficult, even with the greatest care, to maintain a washing machine in a state of bacterial cleanliness; and they have also proved that it is impossible to judge with the eye whether a machine is relatively free from bacteria. A machine may appear to be scrupulously clean, yet be seriously infected with harmful bacteria.

The use of certain disinfectants in suitable concentrations has resulted in the reduction of wastage caused by cleaning machines. The minimum concentrations which, when applied regularly, will be required to control wastage effectively are not yet known precisely. Experiments have shown that there is some promise of improvement by using disinfectants in cleaning the machines themselves, and in the water used for cleaning the eggs, but too much reliance should not be placed on this as a general "cure," because the rigorous and careful use of approved disinfectants in the proper proportions would entail time and care which would mean much to producers, in return for which they would gain little individual advantage in terms of the value of their eggs, determined by candling on delivery of eggs to a packing floor. Satisfactory supervision of the proper application of disinfectants would not be possible and half measures would only mean time wasted without results being obtained.

It is also to be noted that certain disinfectants useful in controlling wastage would be injurious to the fabric of the machines, which would require much more frequent renewal.

When clean and soiled eggs are cleaned on the same machine, wastage or rotting occurs equally, whether the eggs were clean or not when passed over the machine. Thus it is clearly shown that considerable damage may be done by passing eggs which are already clean, over cleaning machines.

The experiments have shown that wastage is very low when the eggs have not been cleaned, whether they are soiled or not.

Several methods of hand cleaning eggs may be relied on to cause only comparatively slight wastage, compared with uncleaned eggs. These include wiping with a clean wet cloth, and the rotating bucket method. A warning is added, however, that systems are liable to abuse—as for example, the continued use of a cloth after it has become dirty, neglect to have frequent changes of clean water, etc. All the methods used have avoided the soaking of eggs for long periods.

If eggs are cleaned in water which is colder than the eggs themselves, favourable conditions are set up for bacteria to penetrate the shells, and rotting is induced. As eggs are warm when laid, and take some time to cool down to atmospheric temperature, it follows that they should not be washed until several hours after gathering. It is all the more important to emphasise this because it is widely recognised that it is easier to remove dirt while the eggs are still warm.

It is important to keep eggs as cool as possible during the time between cleaning and sending to market, as this may have considerable influence on the wastage which any cleaning method may cause.

Experiments showed that various diets fed to the fowls did not produce any appreciable change in the keeping quality of the eggs, although, of course, diet does affect the quantity or number of eggs produced.

The Producers' Responsibility.

Undoubtedly, the use—and even more so, the abuse—of washing machines has been a significent cause of these quality troubles, and something must be done to rectify the position and substantially reduce the losses being sustained, both in the wastage of foodstuffs and in the financial return to the industry. Producers should clearly understand that they cannot escape the financial loss concerned, and it would be erroneous for any producer to conclude that he is not affected, because perhaps, he obtained full price for his eggs which had not deteriorated when delivered to the packer (though some of them did later). The ultimate return to producers is governed by what consumers pay for eggs, and every bad egg destroyed means less money paid by consumers.

It is by no means impossible that some official action may have to be taken to regulate methods of cleaning used, to avoid wastage, but it would indeed be poor economy to sit back and wait for what may come. What action then can be taken by each and every producer to do his share in eliminating this wastage which is causing so much loss of food and money?

Let us consider now, the recommendations made in the Council for Scientific and Industrial Research report, to which we add some comments.

Recommendations by C.S.I.R.

1. Every encouragement should be given to the methods of production which will result in the greatest possible percentage of eggs being gathered naturally clean. This means, of course, that the provision and maintenance of clean nesting material is of utmost importance, for the provision of naturally clean and attractive eggs also ensures eggs of unimpaired keeping quality.

2. It cannot be too strongly urged upon producers, that eggs which are already clean when picked up, should not be washed. It is quite a common practice for producers to pass all eggs gathered over cleaning machines, rather than take the time and trouble to separate out for washing those which are soiled. This practice subjects the clean eggs washed to equal risk of infection with the soiled eggs, and is definitely harmful.

3. The handcleaning method, using frequent changes of clean water, or the bucket method, is less liable to deteriorate keeping quality than washing machines, and should be used by producers to the maximum possible extent. While it is appreciated that washing machines save time on the farm, and handcleaning dirty eggs presents a problem of time and labour, this does not alter the fact that hand and bucket cleaning methods are the best at present available to the producer from the viewpoint of the subsequent keeping quality of the eggs. It is also necessary to emphasise that handcleaning, like any other method can be abused by the use of dirty cloths, dirty water, and unhygienic handling generally—and to be successful requires the exercise of care as does any other process carried out in farming.

4. The use of disinfectants on existing cleaning machines would effect a considerable measure of reduction in egg wastage, but a minimum effective concentration of disinfectants has yet to be determined. It must also be borne in mind that all disinfectants are not necessarily suitable, and that some are likely to injure the fabric of the machines. There is also the very important factor that an appreciable concentration of many disinfectants is unpleasant, and may even be harmful to the hands of the operator handling the eggs and the fluid.

Possible Developments.

It may be that further developments may occur in the construction of cleaning machines; if so, success will be governed to a large extent by the ability of the designer to produce a machine which not only cleans eggs efficiently and quickly and with very small percentage of cracks and breakages, but which is so constructed as to offer no opportunity for harbouring bacteria which cannot be easily, effectively and completely removed in the process of clearing the machine. It will also be necessary to ensure, of course, that the action of the machine does not induce any lodgment of bacteria on the eggs in any harmful way.

Comments by Poultry Expert.

IN order to give a clear picture of the set-up of these experiments it might be mentioned that they were drawn up by officers of the Council for Scientific and Industrial Research, and committees to carry out the work were formed in each of the mainland States; these committees consisted of representatives of the C.S.I.R., the Department of Commerce, the Egg Board or other egg-handling organisations and the Departments of Agriculture.

Each type of experiment was repeated a number of times in one or more States, with untreated eggs from the same farms as controls. Therefore, there can be no doubt about the conclusions arrived at.

The results are of vital importance to the poultry industry, and the co-operation of producers is essential in order to effect improvement in the keeping quality of the eggs, both during the hot summer weather and when placed in cold storage.

Unless the wastage in stored eggs can be reduced considerably, much trouble and

many complaints can be expected when eggs in shell are again exported overseas, and this will influence the prices realised.

Possible Control Methods.

There is evidence in the last two years' tests to indicate that the use of sodium hypochlorite preparations as a disinfectant in the trays of washing machines, will assist in preventing the rots, if at the same time, due precautions are taken to keep the machines clean.

While the experiments have not yet been carried far enough to determine the best disinfectant or the minimum strength which would be effective, it would appear that the sodium hypochlorite preparations used in a concentration sufficient to give 0.5 per cent. of available chlorine, will reduce the trouble considerably. Sodium hypochlorite is obtainable at wholesale chemists, and there are on the market, other chlorine products which may be used for disinfecting machines and eggs. The chemist can supply information concerning the chlorine strength of these products.

It would, therefore, be worth while, pending further investigations in this direction, to use a disinfectant of this type both for cleaning the machines and in the trays, and if found to affect the fabric or metal parts of the machines a lower concentration might be adopted.

At the same time every effort should be made to prevent the eggs from becoming soiled and to wash only those which are dirty.

It is probable that much of the trouble among cold stored eggs this season was due to shortage of labour on the farms resulting in machines not being kept as clean as usual; also to the practice of putting all the eggs over the machines rather than picking out the clean ones.

The findings outlined in this report should receive the serious consideration of all producers and every effort should be made to prevent deterioration in the quality of the eggs.

Swine Fever—(*continued from page* 281.)

no new pigs have been brought on to the premises for some months does not justify the owner in thinking that mortality is not due to swine fever, especially if he feeds garbage to his pigs.

Control of the Disease.

Swine fever is a scheduled disease in all States of the Commonwealth, and must be reported to the nearest Stock Inspector or Government Veterinary Officer. These officers will take the necessary precautions and advise the owner as to procedure.

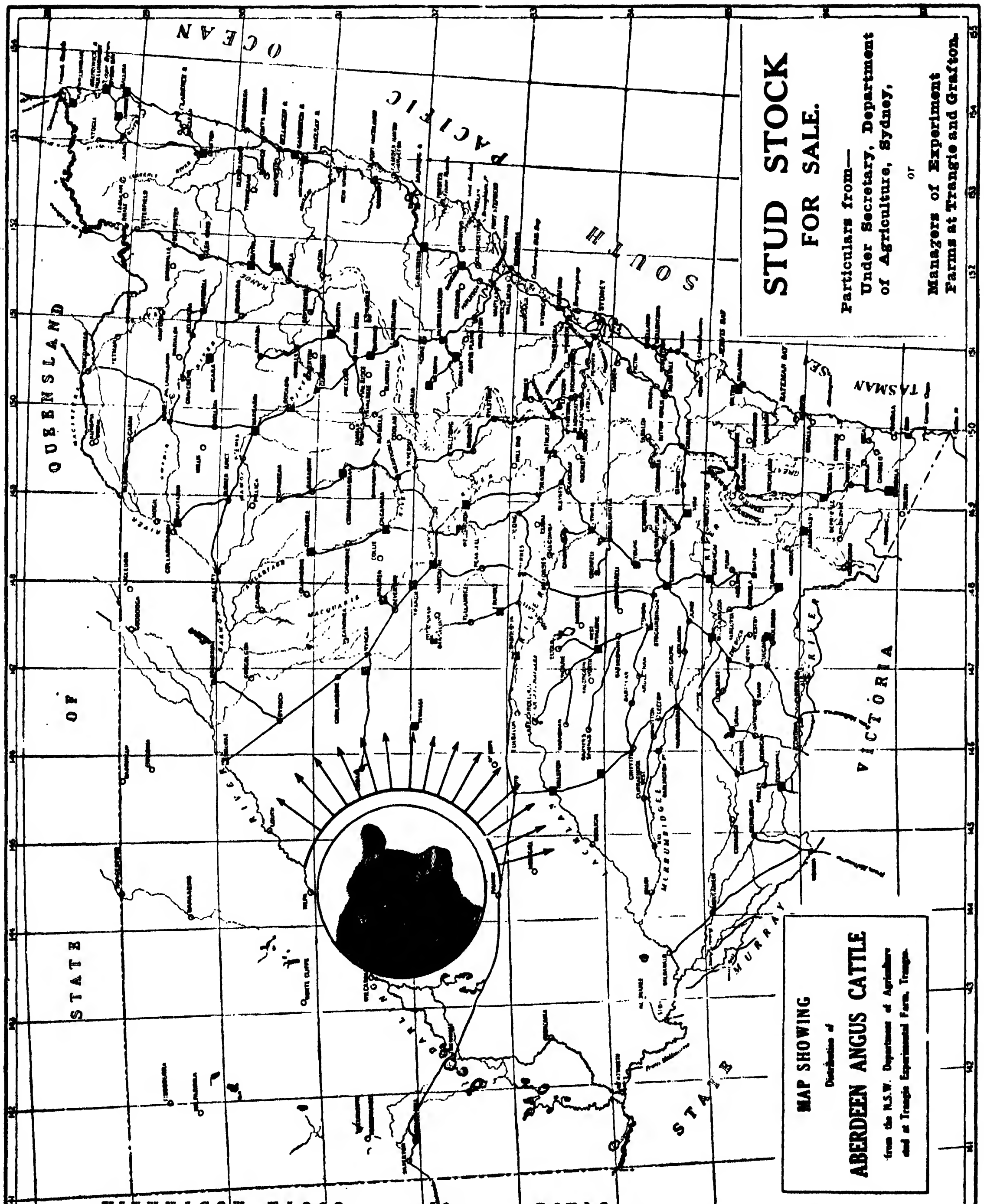
In a country such as Australia, where the disease is not endemic, the best means of control is by the slaughter of all affected and in-contact pigs, the thorough disinfection of all buildings and exposure of them to the sunlight, and by the quarantining of areas where the disease has occurred. This policy has been carried out in the recent outbreaks in both Western Australia and New South Wales.

Beekeeping Hints—(*continued from page* 287.)

the super whilst the bees are edged off the top of the super body, and this causes a very sever strain on the muscles of the back. The best way of doing this job is to place the super on the hive straight away, but to put it slightly cornerwise, as illustrated, and it is thus easy to avoid crushing bees on the minimum of edge space occupied. Then with the weight relieved, very little effort is required to twist the super into its right position without risk of killing any bees.

There are many other ways in which energy may be conserved, and in the heavy work, day after day, they count for a great deal. One of these is the use of honey floor-trucks, usually available from the factory, and which may be used for moving piles of full or empty supers or tins of honey about the honey-room. It is advisable also to make the best use of gravitation and honey-pumps in filling processing tanks, thus avoiding lifting wherever possible.

KEEP ON BUYING WAR SAVINGS CERTIFICATES.


STUD STOCK
FOR SALE.
Particulars from—
Under Secretary, Department of Agriculture, Sydney,
or
Managers of Experiment Farms at Trangie and Grafton.
MAP SHOWING
Distribution of
ABERDEEN ANGUS CATTLE
from the N.S.W. Department of Agriculture and at Trangie Experimental Farm, Trangie.
SOUTH PACIFIC OCEAN
TASMAN SEA
QUEENSLAND
STATE OF SOUTH AUSTRALIA
STATE OF VICTORIA

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
		1943.
F. and C. Ryall, 5 Western Avenue, West Wollongong	57	1 June.
A. D. Frater, King's Plain Road, Inverell	106	1 „
Wollongbar Experiment Farm	112	4 „
St. Michael's Orphanage, Baulkham Hills	18	5 „
S. E. E. Cohen, Auburn Vale Road, Inverell	23	12 „
B. N. Coote, Auburn Vale Road, Inverell	53	14 „
J. De Ville, Inverell	10	15 „
A. N. De Fraine, Reservoir Hill, Inverell	22	15 „
K. W. D. Humphries, " Karoola," Muswellbrook	162	24 „
Cowra Experiment Farm	41	27 „
P. M. Burtenshaw, Killean, Inverell	31	27 „
Sir F. H. Stewart, Dundas	6	30 „
Berry Training Farm, Berry	162	31 „
A. E. Liggins, " St. Leger Dairy," Kuring-gai Chase Road, Turramurra North	52	7 July.
Kahlua Pastoral Co., " Kahlua," Coolac	314	10 „
Lunacy Department, Rydalmere Mental Hospital	65	30 „
W. J. Frizelle, Rosenstein Dairy, Inverell	76	1 Aug.
W. Budden, " Hunter View," Kayuga Road, Muswellbrook	18	7 „
T. McLane, Wellingrove, Inverell	33	10 „
W. Willis, " Rosedale," Inverell	17	13 „
E. L. Killen, " Pine Park," Mumbil	252	23 „
A. Hannaford, Braidwood	20	26 „
W. S. Grant, Braidwood	20	26 „
J. McKenzie, Inverell	35	28 „
Farrer Memorial Agricultural High School, Nemingha	39	29 Aug.
The William Thompson Masonic School Baulkham Hills	50	29 „
Navua Ltd., Grose Wold, via Richmond (Jerseys)	118	4 Sept.
Australian Missionary College, Cooranbong	113	8 „
Department of Education, Gosford Farm Home	40	29 „
A. L. Logue, " Thornbro," Muswellbrook	46	13 Oct.
W. C. Wyatt, Sherwood Road, Merrylands	32	16 „
Woomargama Estate	207	22 „
W. J. Stephenson, " Hill View," Fig Tree	57	1 Nov.
Barnardo Farm School, Mowbray Park	75	4 „
State Penitentiary, Long Bay	10	9 Dec.
		1944.
Limond Bros., Morisset	60	13 Jan.
J. M. Turnbull, " Pastime," Kayuga Road, Muswellbrook	75	15 „
E. R. Fishlock, Fig Tree, Wollongong	38	18 „
St. Ignatius College, Riverview	25	27 „
Department of Education, Yanco Agricultural High School	69	6 Feb.
		1944.
Riverina Welfare Farm, Yanco	74	6 Feb.
St. John's College, Armidale	30	8 „
A. C. O'Dea, Perry Street, Dundas	28	14 „
McGarvie Smith Animal Health Farm, Liverpool	55	22 „
C. Wilton, Bligh Street, Muswellbrook	75	3 Mar.
N. L. Forster, Abington, Armidale (Aberdeen Angus)	188	12 „
Forster and Sons, Abington, Armidale (Jerseys)	87	13 „
Lunacy Department, Morisset Mental Hospital	84	15 „
Wagga Experiment Farm (Jerseys)	81	20 „
Trangie Experiment Farm, Trangie	121	20 „
New England University College, Armidale	12	31 „
Grafton Experiment Farm	191	15 April.
Lunacy Department, Callan Park Mental Hospital	26	1 May.
T. J. Wilks, " Oaks Farm," Muswellbrook	37	5 June.
New England Experiment Farm, Glen Innes (Jerseys)	73	27 „
G. T. Reid, " Narrengullen," Yass	274	3 July.
Farm Home for Boys, Mittagong	49	9 „
St. Vincent's Boys' Home, Westmead	26	20 „
Lidcombe State Hospital and Home	106	30 „
Hurlstone Agricultural High School, Glenfield	37	31 „
Ebsman Bros., Inverell	28	13 Aug.
Peel River Land and Mineral Co., Tamworth (Beef Shorthorns)	82	28 „
Fairbridge Farm School, Molong	92	31 „
Bathurst Experiment Farm	24	9 Oct.
Lunacy Department, Gladesville Mental Hospital	34	23 Nov.
Hawkesbury Agricultural College, Richmond (Jerseys)	110	18 Dec.
		1945.
The Sydney Church of England Grammar School, Moss Vale	51	5 Feb.
Koyong School, Moss Vale	2	8 „
New England Girls' Grammar School, Armidale	30	11 „
W. W. Martin, " Narooma," Urana Road, Wagga	143	22 „
R. C. Dixon, Elwatan, Castle Hill (Jerseys)	31	29 Mar.
Lunacy Department, Parramatta Mental Hospital	66	30 „
A. E. Stace, Taylor Street, Armidale	38	1 April.
F. C. Harcombe, Hillcrest Farm, Warialda Road, Inverell	38	13 „
Parker Bros., Hampton Court Dairy, Inverell	102	17 „
H. F. White, Bald Blair, Guyra (Aberdeen Angus)	186	30 „
Emu Plains Prison Farm	108	7 May.

Tubercle-free Areas.

The following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis :—

Bombala Area.
Inverell Area.
Braidwood Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

MAX HENRY, Chief of Division of Animal Industry.

A Tea Substitute from Toasted Apples.

ACCORDING to a Canadian Government report which has received publicity in the British press recently, growers in the Okanagan Valley, British Columbia, are now producing beverages which provide an excellent wartime substitute for rationed tea and coffee. These fruit beverages developed in the Okanagan have already met a favourable trade response, and they will probably hold a place on the market permanently and eventually become an important factor in stabilising the economy of the orchard country. They are made from dried, desiccated and toasted apples, some being blended with citrus peel. Because of the high sugar content of the Okanagan apple, less sugar is required for these beverages than for tea and coffee.

Brucellosis-free Herd Scheme (Swine).

LIST OF ACCREDITED HERDS.

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Adams, J. P., "Melton," Daysdale.
Bathurst Experiment Farm, Bathurst.
Boardman, C., Camden.
Campbell, D., Hillangrove, "Wamberal," via Gosford.
Chapman, G. E. and Son, "Illabo Park," Alectown.
Cocks, F. D., "Condalarra," Gooloogong.
Cowra Experiment Farm, Cowra.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., "Glengar," Capertee.
Farrer Memorial Agricultural High School, Nemingha.
Fisher, J. R., Furlong's Stud Farm, Richmond-road, Blacktown.
Foley, Mrs. E., Bligh Stud Piggery, Water Lane, Rouse Hill.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Holland, A. L., Argonne, Tubbul.
Hurlstone Agricultural High School, Glenfield.
Maybin, N. C., Towac, Orange.
McCaughey Memorial Agricultural High School, Yanco
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Government Agricultural Training Farm, Scheyville.
Shirley, G. F., "Camelot," Penrith.
Smith, J. M., Eulo Glen, Urana.
Stewart, Sir Frederick, "St. Cloud," Dundas.
Wagga Experiment Farm, Wagga.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., "Gwandalan," Grenfell.
Wilson, A. G., Blytheswood, Exeter.
Wollongbar Experiment Farm, Wollongbar.

Herds Other than Registered Stud Herds.

Bathurst Gaol, Bathurst.
Berry Training Farm, Berry.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Croft, H. M., "Salisbury Court," Uralla.
Glen Innes Prison Camp, Glen Innes.
Gosford Farm Home for Boys, Gosford.
Goulburn Reformatory, Goulburn.
Kenmore Mental Hospital, Kenmore, via Goulburn.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital, Orange.
Parramatta Gaol, Parramatta.
Peat and Milson Islands Mental Hospital, Hawkesbury River.
Pollak, V., Marata, Harrow Road, Glenfield.
Smith, C. W. J., "Norbiton," Canadian Lead.
Stockton Mental Hospital, Stockton.
Yanco Agricultural High School.

Abortion-free Herds.

THE following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion-free :—

Owner and Address.	Number in herd.
Bathurst Experiment Farm (Ayrshires)	24
Bauerle, P. A., Holbrook	12
Bush, W., Ben Lomond	18
Callan Park Mental Hospital (Aberdeen Angus) ...	41
Carrick, G., "Clonlea," Central Tilba	37
Cowley, L., Redbourneberry, Singleton	56
Cowra Experiment Farm (Ayrshires)	71
Department of Education—Farm Home for Boys, Gosford	36
Department of Education—Farm Home for Boys, Mittagong...	36
Dixson, R. C., "Elwatan," Castle Hill	24
Fairbridge Farm School, Molong	93
Farrer Memorial Agricultural High School, Nemingha	35
Forster and Sons, Abington, Armidale (Jerseys) ...	265
Forster, N. L., Abington, Armidale (Aberdeen-Angus) ...	188
Gladesville Mental Hospital	34
Grafton Experiment Farm (Aberdeen-Angus)	29
Grafton Experiment Farm (Australian Illawarra Shorthorns)	93
Hann, O., Chatsworth Road, St. Marys	35
Hawkesbury Agricultural College, Richmond (Jerseys)...	108
Hicks A. A., Estate, Culcairn	52
Hill, F. Pritchard, Bowling Alley Pt. (Jerseys) ...	96
Hordern, E. D., Cabramatta (A.I.S.)	95
Hurlstone Agricultural High School, Glenfield	39
Killen, E. L., "Pine Park," Mumbil	223
Leitch, J. F., "Tunbridge," Merriwa (Aberdeen-Angus)	72
McEachern, H., Tarcutta (Red Poll)	52
Martin Bros., "Narooma," Urana-road, Wagga ...	125
Navua Ltd., Grose Wold, via Richmond (Jerseys) ...	122
New England Experiment Farm, Glen Innes (Jerseys)	97
New England University College, Armidale	5
Peel River Land and Mineral Co., Tamworth	82
Reid, G. T., "Narrangullen," Yass	171
Robertson, D. H., Scone	82
Rydalmere Mental Hospital, Rydalmere	57
Salway, A. E., Cobargo	95
Skinner, D. S., "Wyworrie," Ben Lomond	38
Smith, Jas. C., Ben Lomond	83
Stewart, Sir Frederick, "St. Cloud Stud," Spurway-street, Dundas	9
Trangie Experiment Farm, Trangie	121
Wagga Experiment Farm, Wagga, N.S.W.	45
Walker, Jas. R., "Strathdoon," Wolseley Park ...	32
White, F. J., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	189
Williams, Chas., Ben Lomond	27
Young, A. H., "Rock Lynn," Cudal (Polled Beef Shorthorns)	12

MAX HENRY, Chief of Division of Animal Industry.

July, 1943.

EDITORIAL——

Butter Rationing.

SHRINKING production, more fighting men to be catered for and a contractual obligation to supply Britain with butter have made civilian rationing of that foodstuff unavoidable.

To an above-average butter-eating community the rationing of 8 oz. per person per week may seem severe, but if the alternative is (and it would appear to be) all the butter we can eat and a depleted fighting force plus an under-nourished Britain, then the decision to limit per capita consumption to ½ lb. of butter per week is indeed a wise one.

To those civilians who refuse to be consoled it might bring solace to reflect that men of the forces (those who are doing the real war job and suffering all the hardships) would regard an assured ration of ½ lb. butter per week a real luxury. There is another consolation for the disgruntled: the nutrition authorities are unanimous that the butter ration is adequate to maintain health.

Up to the present the war has touched Australia but lightly. From now on it would appear we must endure some of the "sacrifices" about which so far we have done little more than talk.

Market Sheep and Cattle Now.

A WIDE and urgent appeal is being made to the stockowners by the New South Wales Livestock Production Committee to sell their fat sheep and cattle during the next few months.

There is at present an urgent need for additional supplies of all classes of fat sheep and cattle, and these supplies are needed especially during the next few months, when, it is pointed out, the demand will greatly exceed normal supplies. The reasons for these excessive demands are:—

1. Increased requirements for the Services.

2. Provision of supplies for the United Kingdom.

3. Greater civilian consumption.

Demands for meat by the Services are increasing continually. Supplies for fresh, dehydrated, canned and corned meat for their needs are required urgently and constantly. Moreover, we are under obligation to contribute to the food supply of the severely rationed people of Great Britain, where the average meat ration is less than

three-quarters of a pound per head per week. Civilian consumption in Australia has increased and continues to increase.

Stockowners will realise from the foregoing the urgent need for additional and constant supplies of all classes of fat sheep and cattle.

Other reasons advanced as to why stockowners should now sell their fat sheep and cattle are:—*Firstly*, a greater volume of winter killing will assist the meatworks to retain that seasonal labour which, once it drifts away, will be difficult to replace in the spring; *secondly*, additional supplies now will ease the cool storage position and relieve the demand on slaughtering facilities during the peak of the lamb season; *thirdly*, by trucking sheep and cattle *now* the strain will be eased on transport during the lamb season (trucks are always procurable during the winter months); *fourthly*, it will ease the manpower problem during shearing if "in the wool" sheep are marketed now; and *fifthly*, a better regulated supply of fat stock will tend to stabilise prices throughout the year.

The Pigmeat Acquisition Act.

THE Commonwealth's Pigmeat Acquisition Plan came into force on 14th June. The plan applies to all States except Tasmania, which, however, will be included when necessary.

The plan aims to give stability to the industry and to encourage the production of greatly increased supplies of pigs of baconer weights. Many factors have combined to cause an acute shortage, and the present position calls for a concerted and earnest effort by producers to increase supplies, which are urgently required to meet the demands of the services, civilians and the British Ministry of Food.

All pig carcases between 100/180 lb. chilled weight on the hooks and all choppers, irrespective of weight which had been slaughtererd at establishments registered for this purpose, will be acquired.

Carcases of less than 100 lb. will not be acquired.

Announcing details of the plan, the Minister for Commerce and Agriculture (Mr. Scully) said that it would operate for a period of two years from the date of inauguration, and guaranteed prices would be paid for all pigmeats acquired during that period. The Government, however, reserved the right to alter the plan in any one State if circumstances arising out of the war, and over which it had no control, compelled it to do so.

The plan did not provide for complete acquisition; only those pigs slaughtered at specified registered establishments would be acquired. All operators who had slaughtered pigs since 1st January, 1943, at any of the specified establishments would be automatically licensed. Other operators who desired licences should make application to the Commonwealth Controller of Meat Supplies.

An important new feature of the plan was the extension of the "price-weight" range for baconers up to 180 lb. dressed. Any pigs exceeding that weight would be classified as choppers.

The Commonwealth would pay fixed prices for all carcase meat acquired from licensed operators. Those prices had been worked out in conjunction with the Commonwealth Prices Commissioner at such levels as would enable licensed operators to pay producers the following nett prices on hooks chilled weight at the usual export port.

Carcases over 100 lb. and up to 180 lb.—First quality, 8d. per lb.; second quality, 7½d. per lb.; third quality, 6½d. per lb.

Excessively overfat carcases 100/180 lb.—6d. per lb.

Choppers, all weights—5d. per lb.

The prices paid at country works would be as above, less the usual cost of forwarding the live pigs from the works to the usual export port.

All licensed operators at registered establishments would be required to treat pigs on a weight and grade basis on producer's account, provided at least fourteen days' notice was given by the producer.

Acquired carcases would be disposed of through the normal trade channels as hitherto, but the Controller of Meat Supplies would act, if necessary, to divert pigmeats to the services. All carcases acquired for export would be delivered into store on Commonwealth account as Wiltshire sides, and held in store pending export or other disposal.

Lamp Mantle Shortage to be Relieved.

IF there was a noticeable improvement in the supply of lamp mantles, the person to be thanked should be a farmer's wife in Western Australia, said the Minister for War Organisation of Industry, Mr. Dedman. This lady, Mrs. Gill, of Mt. Barker, had written to him some time ago pointing out the hardship imposed on the rural population by the shortage of these mantles, and asking whether anything could be done about it.

Mr. Dedman was pleased to be able to say that the prospects of obtaining imports were now much better and local production would also be undertaken. Early import difficulties suggested the possibility of local production, but only two men in Australia—an elderly man in poor health and his son—were familiar with the process. The son was in the army and the father could not carry on alone. The Army had recently agreed to release him, following urgent representations by the Department of War Organisation and the Department of Munitions. Supplies of mantles were also promised from U.S.A. under Lease-Lend arrangements and the outlook was quite hopeful.—Issued by the Department of Information.

KEEPING RECORDS FOR BETTER FARMING.

W. H. PAWLEY, First Assistant, Division of Agricultural Economics.

THE Department of Agriculture knows that most farmers realise the value of farm records. However, the difficulty remains of how to go about it. It is of no value to keep records unless they are so planned that they will be really useful at the end of the period. This planning of records is a job for an expert, and the average farmer cannot be expected to tackle it. There is, however, no good reason why the average farmer cannot keep quite satisfactory records, with an amazingly small call upon his time, if he has a proper plan already placed before him.

The Department's Division of Agricultural Economics has now undertaken this task of providing an expert plan which farmers can use. Three systems for keeping records have been drawn up. One system has been designed for wheat, sheep and general grazing districts, one for dairying districts, and a third for districts where orcharding, vegetable growing or general mixed farming prevail.

These systems do not involve bookkeeping or accountancy in any way at all. Each is in the form of a book, which provides separate pages for such things as receipts, expenditure, list of assets, etc. On each page are several columns, with headings provided for each type of income or for each item of cost, as the case may be. The various pages are so planned that all financial and production records can be entered directly into the book, under the appropriate headings. The farmer is not required to transfer entries from one place to another, to balance accounts or to understand or to use any of the technical jargon of bookkeeping. Finally, the records are so planned that, taken together, they will make it possible to tell the farmer the things he is most likely to want to know about his farm business.

Record Books Issued to Approved Farmers.

Arrangements have already been made to issue these books to a limited number of approved farmers who have expressed their willingness to keep careful records to the best of their ability during the year 1943-44. The Division of Agricultural Economics will keep in touch with these men during the year, and will be prepared to give assistance where required. At the end of the year, this Division will analyse these books for the farmer's benefit, but individual results will, of course, be in strict confidence.

Co-operating farmers will also be supplied with important general conclusions, drawn from a comparative study of their own and other farmers' records, which will enable them to measure the success of their own operations and to obtain guidance as to the improvements that can be made in the light of the experience of other farms.

An Extension of the Department's Services.

Many farmers are familiar with and appreciate the assistance and advice given by the Department of Agriculture in relation to the cultivation of their crops and the raising of their livestock, and the Department is anxious to extend these services to cover the business side of farming. It is desired first of all to show how, by keeping adequate records, it is possible to plan the management of the property on sounder lines. Attention to the business aspects is as necessary to financial success as good agricultural methods, and accounts and production records are as important for the modern business of farming as for any other commercial enterprise. Without records it is impossible to plan production so as to get the maximum profit from a farm as a whole.

Record Keeping is Time Well Spent.

Little time is needed to keep the records designed by the Division of Economics. Five minutes each evening will suffice to keep them up to date once the list of assets has been made, and if records are properly used they can make all the difference between working hard for a loss and working hard for a profit—they can, in fact, mean more to a farmers' financial success than five minutes spent in any other way. Many people ask, "Can farmers afford the time

to keep records?" The question should really be "Can farmers afford not to keep records?" The Department is strongly of the opinion that they cannot.

A Further Limited Number of Books to be Issued.

Although these records must be kept for the period 1st July to 30th June, it is not yet too late for enthusiastic farmers to enter this scheme. This applies particularly to dairy farmers, and to farmers in districts where vegetable growing, orcharding or general mixed farming is carried on. However, there are only a limited number of vacancies, as several hundred farmers have already been enrolled. If you are interested, you should write immediately to the First Assistant, Division of Agricultural Economics, Department of Agriculture, Box 36A, G.P.O., Sydney. It is important that you should state clearly what type of farming you are engaged in, so that the correct book can be sent.

W.A.S.P.S. Do Good Work at Port Macquarie.

THE recently formed branch of the W.A.S.P.S. (Women's Agricultural Security Production Service) at Port Macquarie now has a membership of between 70 and 80 (including 28 full-time workers). Every section of the community is represented in this branch, and those who have already been employed by local vegetable growers have been quick to grasp the jobs allotted them.

Growers, many of whom were at first doubtful as to the value of forming a branch of the W.A.S.P.S. (really a local auxiliary of the Women's Land Army), are now satisfied that this band of local women land workers will give security to the vegetable growing industry in their district.

In the last five years the area under vegetables has increased from less than 100 acres to 500 acres, and, as leading growers recently told us, the knowledge that vegetable growers can now rely upon this very enthusiastic and capable body of women helpers will enable them to increase still further the area under tomatoes, carrots, peas, beans and other vegetables.

The Port Macquarie Branch of the W.A,S.P.S. (Secretary, Mr. Campbell; President, Mrs. St. Clair), is working in closest collaboration with the local War Agricultural Committee and the Port Macquarie Vegetable Growers' Association.

Wheat Prices on Sydney Market, 1890-1942.

THE following table, showing the average price of wheat for February and March of each year and also the average yearly price since 1890, was compiled from figures obtained from the Government Statistician and the Division of Marketing:—

Year.	February.	March.	Average price for year.	Year.	February.	March.	Average price for year.	Year.	February.	March.	Average price for year.
	s. d.	s. d.	s. d.		s. d.	s. d.	s. d.		s. d.	s. d.	s. d.
1890	3 6	3 6	3 7¼	1908	4 4	4 5½	4 3½	1926	6 0	5 9	6 2
1891	3 7½	3 10	4 3	1909	4 0¾	4 6½	4 9	1927	5 1½	5 0¾	5 5
1892	4 9	4 9	4 8½	1910	4 1¾	4 1	3 10	1928	5 2	5 5	5 1¼
1893	3 6½	3 6	3 6½	1911	3 7¾	3 5	3 6	1929	4 8	4 8	4 6¼
1894	2 11	2 8	2 9½	1912	3 9¼	3 8½	4 1	1930	4 8½	4 5	3 10¼
1895	2 7	2 7	3 4	1913	3 6½	3 7	3 2¼	1931	2 1¾	2 1¾	2 4½
1896	4 4½	4 5	4 3¼	1914	3 8	3 9¼	4 1½	1932	3 2	3 1	3 0¾
1897	4 8	4 6½	4 5¾	1915	5 6	5 6	5 5	1933	2 8½	2 9¼	2 10½
1898	4 0	4 0	3 8	1916	5 1¾	5 0¾	4 10	1934	2 5¼	2 6¼	2 8¼
1899	2 7½	2 9	2 9	1917	4 9	4 9	4 9	1935	2 11¾	3 1½	3 2½
1900	2 9	2 8	2 8½	1918	4 9	4 9	4 9	1936	3 7¾	3 8¾	4 3¾
1901	2 7	2 7	2 8	1919	5 0	5 0	5 1½	1937	5 1½	5 5½	5 1½
1902	3 2	3 2¾	4 5	1920	8 5	8 10	8 7¼	1938	4 5¼	4 1¾	3 4¾
1903	5 11⅝	5 9¼	5 1¾	1921	9 0	9 0	8 8	1939	2 5½	2 4¼	2 7½
1904	3 0½	3 0¾	3 2	1922	5 2	5 11	5 8	1940	3 9½	3 9½	3 11
1905	3 4½	3 3⅞	3 5	1923	5 8	5 7	5 3½	1941	3 11¼	3 11¼	3 11¼
1906	3 1⅝	3 2¼	3 3½	1924	4 7	4 7	5 5	1942	3 11¼	3 11¼	3 11¼
1907	3 0⅞	3 1½	3 10	1925	6 9½	6 4	6 2¼				

Farm Tenancy in New South Wales.

The Agricultural Holdings Act, 1941, and its Application.

(*Continued from page 266.*)

A. W. S. MOODIE, H.D.A., H.D.D., Senior Agrostologist.

THIS discussion of the Agricultural Holdings Act was commenced in May issue, when the background to the Act—the reasons for bringing it into existence—was set out. In June issue the author commenced an explanation of the various sections and of the ways in which they will operate in practice. This explanation is continued this month.

An Explanation of the Act—*continued.*

PART III.

Division 2.—Compensation in Respect of Increased or Diminished Value of Holding.

Compensation to the Tenant for Increased Value of the Holding due to the Adoption of a Special Standard of Farming (*Section* 13).—In addition to the compensation which he may claim for those improvements listed in the First Schedule to the Act, Parts I, II, and III, the tenant upon quitting the holding may claim compensation for the increased value of the holding to an incoming tenant, due to the continuous adoption of a standard or system of farming which has been more beneficial to the holding than the standard or system (if any) required by the contract of tenancy.

To substantiate such a claim it would be insufficient to show that the farm had been well farmed continuously, and in consequence had been improved. The mere fact that a farm was in bad condition when the tenant entered and was in first class order when he left, would not necessarily warrant a claim being made under this section. The tenant must be able to prove that the adoption of a standard, or the employment of a system more beneficial than that laid down by his agreement has been carried on continuously, and that, as a result, the value of the holding to an incoming tenant has been increased.

One of the chief difficulties in making a claim, will be the comparisons that have to be made and proved. This section of the Act does not apply unless a record of the condition of the holding has been made, nor does it apply to any matter arising before the date of the record.

It is essential that the record shall be of such a nature that an agricultural committee several years hence will be able to picture the condition of the farm when the record was made, and compare it with its present condition. It will be necessary for the agricultural committee to compare the standard of farming required under the contract of tenancy, and that which the tenant has adopted, judge the increase in value to an incoming tenant, and decide how much of that increase is due to the improved standard adopted by the tenant.

In assessing the amount of compensation due to a tenant the agricultural committee must make due allowance for any compensation to be paid to the tenant for any improvement specified in the First Schedule to the Act which has contributed to the increased value of the holding.

Prior to the termination of his tenancy it is essential that the tenant give notice in writing to the landlord of his intention to claim compensation for the increased value of the holding due to the adoption of a special standard of farming.

This portion of the Act dealing with the increased value of a holding due to the adoption of a special system of farming must be considered from another angle. A tenant may, by notice in writing to the landlord, present a demand for arbitration as to the rent to be paid for the holding as from the next ensuing date at which the tenancy could have been terminated by notice to quit given by the tenant. In any such arbitration proceedings the agricultural committee would not take into account any increase in the rental value which is due to improvements executed wholly or partly by and at the expense of the tenant without any equivalent allowance being made by the landlord. Any improvement in the value of property due to the continuous adoption of a special standard of farming would not react against the tenant in an arbitration as to rent. Improvements which the tenant may have been compelled to make under his contract of tenancy would, however, be taken into account by an agricultural committee when dealing with the question of rent.

From the foregoing remarks it is apparent that landlords, in their own interests, should effect radical changes in tenancy agreements. A reasonably high standard of husbandry should be demanded of tenants and the system of farming to be followed should be set out in some detail.

Compensation to the Landlord for Deterioration of the Holding (*Section* 14).—At the termination of a tenancy the landlord may claim compensation for deterioration in the value of the holding caused by failure on the part of the tenant to cultivate according to the rules of good husbandry or the terms of the contract of tenancy. The rights given to the landlord under this section do not prevent him from claiming compensation for dilapidations or for the deterioration of the holding under the contract of tenancy.

Landlords should note that compensation is not payable unless the tenant has been notified in writing prior to the termination of the tenancy of the intention to claim such compensation.

The term dilapidations is commonly associated with the buildings, gates, fences, and structures generally, whilst deteriorations is the term usually applied to the cultivation and management of the soil, and the maintenance of the holding in a state of fertility.

A tenant may be bound by the terms of his contract of tenancy to repair, maintain and keep in good and sufficient repair, order and condition, all fences, walls, pumps, posts, bridges, culverts, dams, roads and all other parts of the premises. Should the tenant fail to fulfil his obligations, the landlord may at the termination of the tenancy lodge a claim for compensation.

In connection with repairs to buildings it should be noted that in the First Schedule to the Act, Part III, No. 25, a tenant may claim compensation as an improvement, repairs to buildings, being buildings necessary for the proper cultivation or working of the holding, other than repairs which the tenant is himself under an obligation to make. Before beginning to execute any such repairs the tenant must give to the landlord notice in writing of his intention, together with particulars of such repairs. He shall not execute such repairs unless the landlord fails to do so within a reasonable time after receiving such notice.

In the case of the land, deterioration includes all acts committed, or waste permitted by the outgoing tenant contrary to the tenancy agreement, and detrimental to the land. Every farm tenant who fails to farm the land in a husbandlike manner is liable to lose his rights to compensation for disturbance, and may be ejected from the farm at any time. A claim against the tenant may arise from unskilful treatment or neglect of the land, obvious from its foul condition; from a programme of cropping detrimental to the land; from the absence of the area of fallow stipulated in the contract of tenancy to be left in fallow at the termination of the tenancy; from the disposal of the produce of the holding (*see* Section 28 dealing with the "Tenants Right of Free Cropping"); or generally under Section 14 of the Act from failure on the part of the tenant to cultivate the holding according to the rules of good husbandry or the terms of the contract of tenancy.

Division 3.—Compensation to the Tenant for Disturbance (Section 15).

This section of the Act was designed to secure a greater measure of security of tenure for tenants, it being considered that liability to pay compensation for disturbance would deter landlords from terminating tenancies for any except good reasons. Compensation for disturbance is payable to those tenants whose contract of tenancy is for any period of less than five years, and is additional to any claim for compensation for improvements and for the adoption of a special system of farming.

Tenants should note that in the event of their contract of tenancy being for any period of less than five years, their right to compensation for disturbance is preserved no matter how long they may actually remain on the holding. A tenant who signs an agreement providing for a tenancy of two or three years may remain on the property for five years or longer. Should the tenancy be terminated by notice to quit given by the landlord at the end of two years, or it may be ten years, the tenant would be entitled to compensation for disturbance.

To avoid liability to pay compensation for disturbance it will be necessary for landlords to provide for the duration of tenancies to be for a period of five years or longer.

Another important point which should be noted by both landlords and tenants is that this section of the Act applies to contracts of tenancy made before, as well as subsequent to, the commencement of this Act.

Compensation for disturbance will not be payable in any case where the landlord has offered in writing to withdraw the notice to quit and where the tenant has unreasonably refused or failed to accept the offer, or where the notice to quit was given prior to the commencement of the Act.

The right of the tenant to compensation for disturbance does not prevent the landlord from terminating the tenancy at short notice for any of the reasons enumerated hereunder. Termination of the tenancy in this way would result in the tenant losing his claim to compensation for disturbance. Notice to quit may be given to a tenant for any of the following reasons:—

(a) For not cultivating the holding according to the rules of good husbandry.

(b) For failing to comply within a reasonable time with a written notice requiring him to pay rent due or for failing to comply with any written notice requiring him to remedy any breach, being a breach which was capable of being remedied, of any term or condition of the tenancy consistent with good husbandry.

(c) For materially prejudicing the interests of the landlord by committing a breach which was not capable of being remedied of any term or condition of the tenancy consistent with good husbandry.

(d) For bankruptcy or for compounding with his creditors.

(e) For failure to agree to a demand made in writing by the landlord for a determination as to the rent to be paid for the holding as from the next ensuing date at which the tenancy could have been terminated by notice to quit given by the landlord.

(f) For failure to comply with a written request from the landlord requiring him to execute an agreement setting out the existing terms of the tenancy.

Cultivation Not According to the Rules of Good Husbandry (Section 15 (2)).—The landlord of a holding may at any time make a demand in writing upon the tenant for arbitration under this Act, as to whether the tenant is cultivating the holding according to the rules of good husbandry. If in such arbitration the agricultural committee is satisfied that the tenant is not cultivating the holding according to the rules of good husbandry it shall make an award accordingly.

Determination of the Rent of a Holding.—By giving notice in writing to his landlord, a tenant may require the question of the rent of the hold-

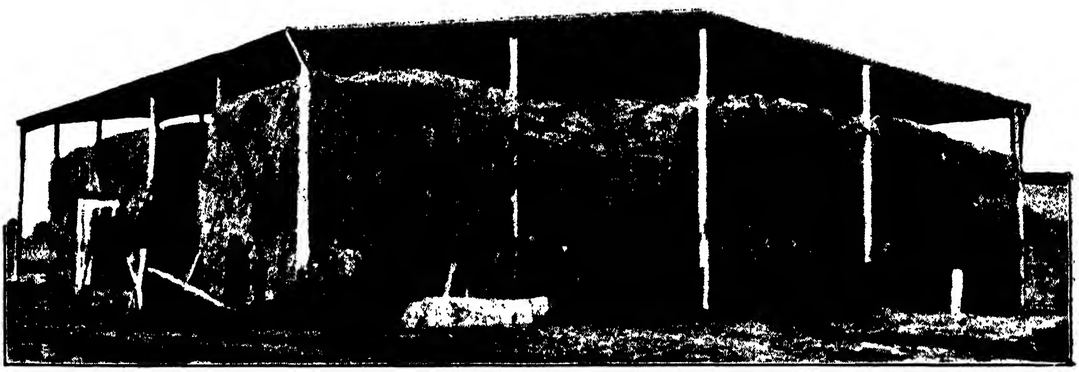
ing to be referred to arbitration. The agricultural committee's determination as to rent would take effect as from the next ensuing date at which the tenancy could have been terminated by notice to quit given by the tenant, and would not become operative automatically immediately following the decision of the agricultural committee. Should the landlord refuse, or within a reasonable time fail, to agree to a demand for such an arbitration, and should the tenant as a result terminate the tenancy by a notice stating that it is given for the reason that the landlord has refused a demand for an arbitration as to the rent, the tenant shall be entitled to compensation for disturbance. Compensation is not payable, however, if the circumstances are such that the landlord could have terminated the tenancy for any of the reasons given in the Act in paragraphs (a), (b) and (c) under the heading "Compensation to the Tenant for Disturbance."

Under normal circumstances, therefore, the landlord must be prepared to refer the question of rent to arbitration following a demand made by the tenant, or to pay compensation for disturbance should the tenant quit the holding as a result of his refusal.

the tenant refuse to agree to such an arbitration he would lose his right to compensation for disturbance.

Amount Payable for Compensation for Disturbance.—Compensation for disturbance shall be a sum representing such loss or expense directly attributable to the quitting of the holding as the tenant may unavoidably incur. It is intended to cover expenses in connection with the sale or removal of his household goods, farming implements, fixtures, farm produce, or farm stock on or used in connection with the holding, and shall include all expenses reasonably incurred by him in the preparation of his claim for compensation, but shall not include costs of an arbitration to determine the amount of the compensation. Costs of an auction or a clearing-out sale, including incidental expenses, would be taken into account in determining the amount of compensation.

In order to avoid disputes, compensation for disturbance shall, except where the tenant is a share-farmer, be computed at an amount equal to one year's rent of the holding, unless it is proved that the loss and expenses so incurred exceed an amount equal to one year's rent of



A Well-filled Barn.

Tenants and share-farmers are entitled to compensation for fodder stored at the termination of tenancy.

The Act does not confer upon the tenant the right to demand at any time an arbitration as to the rent to be paid for a holding. Should the demand be so made that the increase or reduction of the rent would take effect at some time before the expiration of two years from the commencement of tenancy, or from the date on which a previous increase or reduction of the rent took effect, the provisions regarding arbitration as to rent do not apply. In effect the tenant can only exercise his right to demand an arbitration as to the rent of a holding every two years.

In cases where the tenant makes a demand in writing for an arbitration as to the rent to be paid for the holding and the demand is agreed to by the landlord in writing or otherwise, the matter shall be referred to an agricultural committee.

The landlord may also demand an arbitration as to the rent to be paid for a holding as from the next ensuing date at which the tenancy could have been terminated by notice to quit given by him at the date of the said demand. Should

the holding, in which case the sum recoverable shall be the whole loss and expenses so incurred up to a maximum amount equal to two years' rent of the holding.

In the case of a share-farmer the amount payable as compensation for disturbance shall be limited to the actual expenses incurred in the sale or removal of his household goods, farming implements, fixtures, farm produce, or farm stock, on or used in connection with the holding, and shall include all expenses reasonably incurred by him in the preparation of his claim for compensation.

Before compensation for disturbance is payable the tenant or share-farmer must:

(a) Give the landlord a reasonable opportunity of making a valuation of any goods, implements, fixtures, produce or stock to be sold.

(b) Not less than one month before the termination of the tenancy, give notice in writing to the landlord of his intention to claim compensation for disturbance.

Compensation for disturbance is not payable in cases where the tenant dies within three months

before the date of the notice to quit. In cases where a tenant has accepted a notice to quit part of the holding as a notice to quit the entire holding, if the part of the holding affected by the notice to quit is less than one-fourth part of the original holding, or the part of the holding which the tenant could retain is reasonably capable of being cultivated or worked as a separate holding, compensation for disturbance is not payable except in respect of the part of the holding to which the notice to quit related.

Compensation for disturbance is not payable where a written contract of tenancy has been entered into between a landlord who has been in occupation of the holding for not less than twelve months prior to the creation of the tenancy, and a tenant, on the express condition that if the landlord desires to resume that occupation before the expiration of a specified term not exceeding seven years the landlord shall be entitled to give notice to quit within the specified term without being liable to pay compensation for disturbance. Such notice to quit must specify that the landlord desires to resume occupation and it must comply with the provisions relating to the period of notice (see Part V). It is important to distinguish between a contract of tenancy covering such an arrangement and a contract of tenancy as defined under the Act. In this particular case the contract of tenancy must be in writing.

Compensation for disturbance may be claimed in addition to compensation for which the tenant or share-farmer is entitled for improvements.

Division 4.—Compensation in Case of Tenancy under Mortgagor (Section 16).

This section is included in the Act to preserve the right of a tenant to any compensation which may be due to him for crops, improvements, tillages or other matters connected with the holding, should a mortgagee take possession, in which event the tenant's rights may be enforced against the mortgagee.

If the contract of tenancy is for a tenancy from year to year, or for a term of years not exceeding five, at a rack-rent, the mortgagee shall, before he deprives the occupier of possession otherwise than in accordance with the contract of tenancy, give to the occupier six months' notice in writing of his intention to deprive him of possession, and if he so deprives him, compensation shall be due to the occupier for his crops and for any expenditure upon the land which he has made in expectation of remaining on the holding for the full term of his contract of tenancy.

Any sum which may be due to the occupier for compensation, or for any costs connected therewith, may be set off against any rent or other sum due from him in respect of the holding, but unless so set off shall, as against the mortgagee, be charged and recovered in accordance with the provisions of this Act relating to the recovery of compensation due from a landlord who is a trustee.

If the mortgagee and the occupier fail to agree as to the amount, and time and mode of payment of the compensation, the difference shall be settled by arbitration under this Act.

Division 5.—Arbitration.

It is extremely important for landlords and tenants to be conversant with the procedure set down in this Act regarding arbitration.

Any question, difference, dispute or other matter whatsoever which under this Act is required or permitted to be referred to arbitration shall be determined by an agricultural committee as arbitrators in accordance with the provisions set out in the Second Schedule to this Act. This procedure must be followed notwithstanding any agreement under the contract of tenancy or otherwise providing for a different method of determination.

Matters which must be referred to an agricultural committee for an arbitration include:

(a) Objection or dissent by the landlord to a notice in writing from the tenant indicating his intention to carry out any of the improvements included in Part I of the First Schedule to the Act.

(b) A dispute as to the amount and time and mode of payment of compensation for any improvement comprised in the First Schedule to the Act.

(c) A claim by a tenant for compensation for the increased value of the holding due to the adoption of a special system of farming.

(d) A claim by a landlord for compensation for the deterioration of a holding.

(e) A question as to the amount of rent to be paid for a holding.

(f) A demand by a landlord for an award stating that the tenant is not cultivating the holding according to the rules of good husbandry.

(g) A dispute as to the amount of compensation to be paid to a tenant for disturbance.

(h) A dispute arising between a mortgagee in possession and a tenant as to the amount and time and mode of compensation to be paid to the tenant for the matters referred to in Division 4 above.

(i) A dispute regarding the value of fixtures and buildings to be paid by a landlord to a tenant.

(j) A dispute as to the reduction in rent upon the quitting by the tenant of part of a holding.

(k) Differences arising between landlord and tenant regarding compensation payable for hay, silage, etc., stored by the tenant.

Any claim to compensation under the Act shall cease to be enforceable after the expiration of two months from the termination of the tenancy unless particulars thereof have been given by the landlord to the tenant or by the tenant to the landlord, as the case may be, before the expiration of that period. Where a tenant lawfully remains in occupation of part of a holding after the termination of the tenancy, particulars of a claim relating to the part of the holding which he still retains may be given within two months from the termination of the occupation.

Where a claim for compensation has been referred to arbitration and the compensation payable under an agreement is by the Act to be substituted for compensation under the Act, such compensation as is to be so substituted shall be awarded in respect of any improvement provided by the agreement.

In a dispute referred to an agricultural committee for an arbitration under the Act the tenant may have two sets of claims, viz., those

under which compensation provided for in the agreement is to be substituted for compensation under the Act, and those for which no such provision has been made. In the former case the compensation awarded would be that provided for under the terms of the agreement, as long as the amount was fair and reasonable.

Any party to an arbitration under the Act may appear before the agricultural committee either personally or by his representative, but such representative must not be a barrister or solicitor.

An arbitration committee shall state separately in its award the amounts awarded in respect of the several claims referred to it and may, if it thinks fit, make an interim award for the payment of any sum on account of the sum to be finally awarded.

Where any sum agreed or awarded under the Act to be paid for compensation, costs, or otherwise by a landlord or tenant of a holding, is not paid within fourteen days after the time when payment becomes due, it shall, subject as in the Act provided, be recoverable as a debt in any court of competent jurisdiction.

Where a holding has become vested in more than one person in several parts and the rent payable by the tenant of the holding has not been apportioned with his consent or under any statute, the tenant shall be entitled to require that any compensation payable to him shall be determined as if the holding had not been under divided ownership. In any arbitration under the Act as to such compensation the agricultural committee shall where necessary apportion the amount awarded between the persons who for the purposes of the Act together constitute the landlord of the holding. Any additional costs of the award caused by the apportionment shall be paid by those persons in such proportions as the agricultural committee shall determine.

PART IV.

Fixtures and Buildings (Section 21).

Any engine, machinery, fencing, or other fixture affixed to a holding by a tenant before or after the commencement of the Act, and any building erected by him for which he is not under the Act or otherwise entitled to compensation, shall be the property of and be removable by the tenant before or within a reasonable time after the termination of the tenancy. The only exception to this provision is where the tenant has erected such a building or fixture in pursuance of some obligation, or instead of some fixture or building belonging to the landlord.

Before removing any fixture or building the tenant must pay all rent owing by him and must satisfy all his obligations to the landlord in respect of the holding. He shall also give one month's notice in writing to the landlord of his intention, and afford the landlord an opportunity to purchase the fixture or building in question at the fair value thereof to an incoming tenant. Should any dispute arise as to value, it shall be determined by arbitration under the Act.

In the removal of any fixture or building the tenant shall not do any avoidable damage to any other building or other part of the holding. Should any unavoidable damage be caused in the removal it must be made good by the tenant.

PART V.

Duration of Tenancies.

Contracts Relating to Term of Tenancy (*Sections 22 and* 23).—For many years tenants have complained that their operations were hampered by insecurity and insufficiency of tenure. After the commencement of the Act all tenancies granted for an expressed term of less than two years shall by virtue of the Act be automatically extended to a term of two years. Furthermore, by Section 23, the tenancy can only be then terminated by at least twelve months' written notice of termination given by either the landlord or the tenant. The only exception to this provision is a tenancy for the sole and expressed purpose of the agistment of stock, in which case the term may be for a period not exceeding one year. In the case of tenancies granted after the commencement of this Act, for an expressed term of two years or more, no automatic extension of term is effected, but the Act requires that not less than one year nor more than two years' written notice of termination shall be given either by the landlord or tenant. If the notice required to be given, either in the case of a term extended to two years, or a term originally granted for two years or more is not given, the tenancy shall continue as a tenancy from year to year, but otherwise as far as applicable on the terms of the original tenancy. In effect these provisions mean that the tenant must give, or be given, notice of termination before the commencement of his last year of tenancy and no provisions to the contrary in any agreement or under any other Act shall affect this requirement.

Leases in existence at the commencement of the Act will not be affected by these sections.

These sections of the Act must be considered in conjunction with the section dealing with compensation for disturbance. Should the tenant give notice of his desire to terminate the tenancy, he would have no claim to compensation for disturbance. On the other hand, when the notice to quit is given by the landlord, unless it is given for one of the reasons mentioned under the heading "Compensation to the Tenant for Disturbance," or the original contract of tenancy provided for a tenancy of five years and upwards, the tenant may claim compensation for disturbance, as well as any other compensation to which he may be entitled.

Notices to Quit (*Section* 24).—Any notice to quit a holding is invalid if it purports to terminate the tenancy before the expiration of twelve months from the end of the then current year of tenancy. Where the date of commencement of a tenancy is unknown to the person giving the notice, the tenancy must not be terminated before the expiration of twelve months from the date of the notice. This section is directed to those tenancies usually terminated by notice. In the case of a tenancy at will, as the twelve months' notice is to be calculated from the end of a year, the effect is that the tenancy must endure for at least two years.

This section of the Act does not apply to any notice given for any of the reasons specified in the Act in paragraphs (a) to (f), both inclusive, in the section dealing with "Compensation to

the Tenant for Disturbance." Under normal conditions the tenancy must be terminated according to the procedure outlined above, but where the tenant has failed to fulfil certain obligations the tenancy may be terminated at shorter notice by the landlord.

This section of the Act does not apply to any notice given by a tenant to a sub-tenant or any notice given before the commencement of the Act, but it does apply to existing tenancies.

Notices to Quit Part of Holding (*Section* 25).—Where a tenancy is not for a fixed term, a landlord may give to the tenant notice to quit part of the land if he desires to use it for any of the following purposes:—

(1) The planting of trees.

(2) The opening or working of any coal, ironstone, limestone, brick, earth or other mineral or of a stone quarry, clay, sand, or gravel pit, or the construction of any works or buildings to be used in connection therewith.

(3) The making of a watercourse or reservoir.

(4) The making of any road, railway, tramroad, siding, or any wharf, pier or other work connected therewith.

Should the notice to quit state that it was given with a view to the use of the land for one of the above purposes, the fact that it relates to part of the holding only does not affect the validity of such a notice. In such cases the provisions of the Act regarding compensation will apply as if the part to which the notice relates were a separate holding.

Where portion of a holding is taken over by a landlord for any of the above purposes the tenant will be entitled to a reduction of rent proportionate to the part so taken over, and in addition a further reduction may be allowed for any depreciation in the value of the residue of the holding, retained by the tenant, caused by the loss of the part taken over by the landlord.

As regards compensation, the tenant may claim compensation as if the portion taken over by the landlord were a separate holding.

In cases where a landlord has served a notice to quit part of the holding the tenant may, within twenty-eight days after service of the notice to quit, serve on the landlord a notice in writing to the effect that he accepts it as a notice to quit the entire holding as from the expiration of the then current year of tenancy. Reference should be made to the division relating to compensation for disturbance and its application to a case where the tenant quits the entire holding in the circumstances mentioned in this paragraph.

PART VI.

Miscellaneous Rights of Landlord and Tenant.

Landlord's Right of Entry to View (*Section* 26).—A landlord or any person authorised by him may at all reasonable times enter the holding for the purpose of viewing the state of the holding.

Penal Rents (*Section* 27).—Notwithstanding any provision in a contract of tenancy making the tenant of a holding liable to pay a higher rent or other liquidated damages for any breach or non-fulfilment of a condition in the contract, the landlord shall not be entitled to recover any sum in excess of the damage actually suffered by him.

This section does not apply to any condition in the contract against the breaking up of permanent pasture, the grubbing of undergrowth or the falling, cutting, lopping or the ringbarking or injuring of trees.

Tenant's Right to Practice any System of Cropping (*Section* 28).—The tenant of a holding shall have full right to practice any system of cropping of the arable land without incurring any penalty, forfeiture or liability. This right is not affected by any provisions to the contrary in the contract of tenancy. Should he exercise this right he must make suitable and adequate provision to protect the holding from injury or deterioration.

If the tenant exercises his rights in this respect in such a manner as to injure or deteriorate the holding, or to be likely to do so, the landlord shall be entitled to recover damages at any time, and if necessary to obtain an injunction from the Supreme Court restraining the tenant from exercising his rights under this section.

The expression "arable land" does not include land in grass which by the terms of the contract of tenancy is to be retained in grass throughout the tenancy.

Compensation for Hay, Silage, etc., Stored by the Tenant (*Section* 29).—This section of the Act is highly important to tenants, particularly to those in coastal districts. A tenant is sometimes in the position of having on hand considerable quantities of loose hay and silage at the termination of his tenancy. Loose hay can be transferred to another holding, although rather difficult to handle, but it is practically impossible to move silage. A number of instances are on record where a clause in the contract of tenancy forbade the tenant to move conserved fodder. yet made no provision for compensation. In other cases tenants finding it impossible to move stored fodders have been refused compensation.

Under the Act a tenant who has stored on the holding hay, silage, straw, roots, manure or compost, shall on quitting his holding be entitled to obtain from the landlord the value to an incoming tenant of any material so stored.

In the case of a share-farmer, he shall be entitled to a share of the value equivalent to his share of the produce of the land or the proceeds of the sale thereof in accordance with the provisions of the share-farming agreement.

When an incoming tenant has, with the consent in writing of his landlord, paid to an outgoing tenant compensation for any hay, straw, silage, roots, manure or compost stored on the holding, he shall be entitled on quitting the holding to claim compensation in the same manner as the outgoing tenant.

In cases where the landlord and tenant disagree as to the amount and time and mode of payment of compensation the difference shall be settled by arbitration under the Act.

Records of the Holding to be Kept (*Section* 30).—At any time during the course of a tenancy the landlord or tenant may require a record to be made of the condition of buildings, fences, gates, roads, drains, ditches and the cultivation of the holding. In addition, a tenant may require a record to be made of any existing improvements executed by him or for which he has, with the written consent of the landlord, paid compensa-

tion to an outgoing tenant. He may also require a record to be made of any fixture or building which under the Act he is entitled to remove.

The above records may be made by a person agreed upon by the landlord and tenant, or, in the event of failure to agree, by a person appointed by the Minister for Agriculture. In default of any agreement as to the costs of making such records, the cost shall be borne by landlord and tenant in equal shares.

Extension of Meaning of Holding (Section 31). —Where the land to which a contract of tenancy relates includes land which owing to the nature of the buildings thereon, or the use to which it is put, is not a holding within the meaning of the Act, the provisions of the Act relating to compensation will apply to the balance of the land as if it were a separate holding, unless otherwise agreed upon in writing.

This section of the Act is intended to apply to cases where the contract of tenancy covers a holding, portion of which is utilised for some purpose other than agriculture. In the case of a large area of land upon a portion of which a factory is established, the section not utilised for industrial purposes may be used for agriculture, in which event the provisions of the Act regarding compensation for improvements and disturbance would apply to the section used for agriculture in the absence of any written agreement to the contrary.

PART VII.

General Provisions.

Provisions as to Limited Owners (Section 32). —In some instances the landlord of a property is not the absolute owner. Under the provisions of the Act such a landlord, whatever his estate or interest in the holding, may give any consent, make any agreement, or do or have done to him any act in relation to improvements and other matters in respect of which compensation is payable under the Act. If the holding concerned is a leasehold, his position would be the same as if he was absolutely entitled to that leasehold.

Recovery of Compensation from a Trustee (Section 33).—Where a landlord is entitled to receive the rents and profits of a holding, otherwise than for his own benefit, any sum agreed or awarded to be paid for compensation or otherwise shall be recoverable only as follows:—

(a) The amount due shall not be recoverable personally against the landlord, but it shall be a charge on and recoverable against the holding only.

(b) Should the landlord pay to the tenant the amount due to him, he will be entitled to a charge on the holding.

(c) If the landlord fails to pay to the tenant the amount due to him, the tenant shall be entitled to a charge on the holding.

(d) A charge made under this section shall be a charge upon land within the meaning of section one hundred and eighty-seven (187) of the Conveyancing Act, 1919-39, and may be registered accordingly.

Estimation of Best Rent (Section 34).—In estimating the best rent or reservation in the nature of rent of a holding for the purposes of any Act, deed or other instrument, authorising a lease to be made, provided that the best rent or reservation in the nature of rent is reserved, it shall not be necessary to take into account against the tenant any increase in the value of the holding arising from any improvements made or paid for by the tenant.

Avoidance of Contract Inconsistent with Act (Section 35).—Subject to the provisions of the Act, any contract (whether under seal or not) made by a tenant of a holding, by virtue of which his right to claim compensation under the Act is taken away or limited, shall to that extent be void.

As far as the tenant is concerned this clause is one of the most important in the Act, inasmuch as by its provision his right to claim compensation is preserved despite any clause in a contract of tenancy which may purport to limit or take away this right.

Serving of Notices (Section 36).—Any notice, request, demand, or other instrument under the Act may be served on the person to whom it is to be given either personally or by leaving it for him at his last known place of abode or business in or out of New South Wales or by sending it through the post in a registered letter addressed to him at that place of abode or business, and in such case service shall be deemed to have been made at the time at which the registered letter would be delivered in the ordinary course of post: and in the case of a notice to a landlord "the person to whom it is to be given" shall include any agent of the landlord entitled or authorised to receive any rent payable to the landlord.

General Saving of Rights (Section 37).—Except as in the Act expressed, nothing in the Act shall prejudicially affect any power, right or remedy of a landlord, tenant or other person vested in or exercisable by him by virtue of any other Act or law, or under any custom of the country or otherwise in respect of a contract of tenancy or other contract or of any improvements, deteriorations, waste, emblements, tillages, away-going crops, fixtures, tax, rate, rent or other other thing.

(*To be continued.*)

THERE is no disadvantage in delaying the sowing of maize in central coastal districts to avoid black beetle. In the areas subject to this pest there is very little to be gained by endeavouring to place maize grain on the market very early. In fact, districts further north have a decided advantage in this connection and usually capture this early market.

From the point of view of early green fodder, maize is not as valuable as Japanese millet, which will give quick grazing and is considered by dairy farmers almost equal to lucerne for milk production. Autumn sown crops, such as oats and turnips, can be used for fodder up to September, and the ground can then be prepared for the sowing of maize in November or early December.

The Geologic Sources Of the Commoner Chemical Elements.

Their Agricultural Significance.

(*Continued from page* 147.)

A. N. OLD, B.Sc.Agr., Analyst.

BROMINE.

OF the four halogen elements—chlorine, fluorine, bromine and iodine—bromine has the least eventful history; from the time of its discovery in 1826 by A. J. Balard, its elemental nature and its close relation ("most sustained analogies" said Balard) to chlorine and iodine were recognised.

Balard obtained the element from the mother-liquor remaining after the crystallisation of salt from the waters of Mediterranean salt-marshes. He named the new element—from the Greek "bromos" a stench, because of its disagreeable odour—and prepared hydrobromic, hydrobromous and bromous acids.

Some years before Balard's discovery, the German chemist, Liebig, had received a similar product rich in bromine, with a request for its examination, but did not give the matter much attention as he mistook the bromine for iodine chloride. Upon hearing of the discovery of the new element by Balard, Liebig realised his error and thereafter kept the vessel in a special cabinet which he maintained for the storing of "mistakes."

Bromine is a non-metal, red in colour and shares with the metal mercury the distinction among the elements of being liquid at ordinary temperatures. Other elements are either solids or gases.

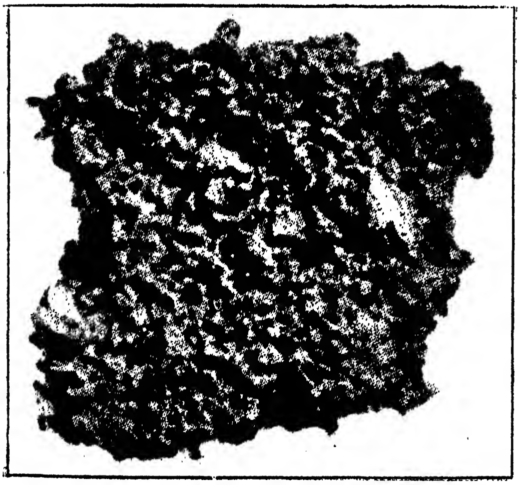
Occurrence.

Bromine does not occur so abundantly in the earth's crust as either chlorine or fluorine, but it is more common than iodine. Sea water contains .007 per cent. of bromine, the element accounting for .2 per cent. of the dissolved salts. The Dead Sea, at a depth of 300 metres, contains .7 per cent. of bromine, which represents 2 per cent. of

the total salts. Mellor states that the total bromides in marine waters approximate 120,000 million tons.

The element is not known to occur in the free state in nature. Hydrogen bromide has been reported from the fumaroles around Vesuvius.

The chief source of commercial bromine was for many years the Stassfurt salt deposit, in which bromine occurs in the form of brom-carnallite, $MgBr_2$. KBr. $6H_2O$. Brom-bischofite Mg (Cl Br). $6H_2O$. also occurs in salt deposits. The brines of Michigan, Ohio, Pennsylvania, and West Virginia, U.S.A., are rich enough to be a commercial



Embolite [Ag (Cl Br)], Broken Hill.
[*After G. Smith.*

source; in fact, bromine is fairly widely distributed in natural waters and all products derived directly or indirectly from sea-salt contain traces. Bromine is absorbed by marine animals and plants, particularly sea weeds, and occurs in the ash derived from them. It is stated to be a constituent of Tyrian purple, the dye once obtained from certain marine animals.

Of the insoluble bromine compounds, those with silver are of importance as ores of that metal. They include brom-argyrite AgBr, embolite Ag (Cl,Br) and iodo-embolite Ag(Cl,Br,I); the last two, at least, were quite common in the Broken Hill lode, especially in the higher levels. These silver ores are also recorded from Chile.

Bromine and the Petroleum Industry.

The chief commercial use of bromine is in the preparation of tetra-ethyl lead, the well-known anti-knock agent added to petrols. Bromine, though not an actual constituent of the lead compound, is required in such large quantities that a new source of bromine was found necessary, and for some years now the chief commercial source has been sea-water. Secondary sources are the German Stassfurt deposits, the brine springs of the U.S.A. referred to above, the waters of the Dead Sea and the Saksky saline lake of the Crimea. American production of bromine is 1938 was 33,500,000 lb., representing 80 per cent. of the world total.

Little Agricultural Significance.

Although bromine occurs very widely in minute amounts in plant and animal tissues, the weight of evidence at present indicates that it has no biological significance, but occurs fortuitously as a result of food intake. The significance of the element in agriculture is small and indirect, depending on its other commercial applications.

Other Uses.

Bromine is an oxidising agent and is of particular value in organic chemistry. It is interesting to recall that it was made use of by Emil Fischer in his classic researches on the sugars, culminating in their laboratory synthesis.

The silver compound in particular is used widely in photography. Sodium, potassium and ammonium bromide are of medicinal value as sedatives of the nervous system. A number of organic bromine compounds such as bromo-ketone and bromo-benzyl-cyanide, as well as bromine itself have been used in chemical warfare. Bromoform, because of its high specific gravity (2.9), finds an application in the separation of minerals by flotation. Among the miscellaneous laboratory uses of bromine compounds may be mentioned the value of many of them such as brom cresol green and brom thymol blue, as pH indicators.

(*To be continued.*)

Approved Seed—July, 1943.

To assist in the production and distribution of approved seed of recommended varieties of crops and vegetables, the Department publishes in this list each month the names and addresses of growers of such seed. For this service a charge of 2s. 6d. is made for each insertion of each variety listed. The number of varieties listed on behalf of each grower will be restricted to twenty-five for the time being. The Department may inspect the crop producing the seed, and in all cases a sample of the seed must be sent to the Department of Agriculture with information as to the location of its production, and must be accompanied by the fee indicated above.

If any seed producer does not wish to pay the advertising charge he may submit his name with the variety of seed and sample to the Department, and if it is approved his name will be listed in the Department and information will be supplied regarding it to inquirers.

Tomatoes—
Red Marhio No. 95—Rumseys Seeds Pty. Ltd., 331 Church-street, Parramatta.
Vetemold—Rumseys Pty. Ltd., 331 Church-street, Parramatta.
Potentate—Rumseys Pty. Ltd., 331 Church-street, Parramatta.

Cauliflower—
Shorts—H. Burton Bradley, Sherwood Farm, Moorland.

French Beans—
Brown Beauty—Mr. H. P. Richards, "Sovereignton," Tenterfield.
Granda—Mr. H. P. Richards, "Sovereignton," Tenterfield.

Varieties of Approved Seed Available.

IN order that farmers may be directed to what are regarded by the Department as the most satisfactory local sources of approved seed of recommended commercial varieties of farm crops and vegetables, the Department is willing to supply information concerning such sources of seed of the following varieties:—

French Beans.—
Tweed Wonder, Wellington Wonder.

Pumpkins.—
Queensland Blue.

Melon.—
Hawkesbury Wilt-resistant.

Grasses, etc.—
Phalaris tuberosa, Subterranean Clover (mid-season), Sheep's Burnet, Lucerne, Sudan.

Selected Citrus Buds.

The Co-operative Bud Selection Society, Ltd.

FOR some years it has been recognised that in most citrus groves there are trees that rarely produce sufficient fruits to be payable, whilst other trees are more constant producers of good quality and payable crops, so that with a view to enabling nurserymen to supply trees of the most productive and remunerative standards to planters, the above Society was formed under the aegis of the Department of Agriculture, and consists of representative fruitgrowers and nurserymen. The Society does not and cannot make profits, but merely exists to improve the fruit-growing industry by making available for budding selected buds from special trees of the best type of quality fruit and of reputed good bearing habit only. Trees from such buds should undoubtedly be more profitable and appeal to all progressive orchardists.

The Co-operative Bud Selection Society Ltd. supplied the following selected buds to nurserymen during the 1942 budding season, trees from which should be available for planting during the 1943 season:—

Nurseryman.	Washington Navel.	Valencia.	Marsh Grapefruit.	Wheeny Grapefruit.	Eureka Lemon.	Lisbon Lemon.	Emperor Mandarin.	Thorny Mandarin.	Total.
Adamson, T., Ermington ...	4,000	4,000	...	...	2,000	...	...	...	10,000
Cambourn, H., Gosford... ...	2,000	2,000	...	...	1,000	...	200	...	5,200
Catt, F. D., Carlingford ...	3,000	5,000	1,000	...	3,000	500	...	...	12,500
Eyles, A. T., Rydalmere ...	4,000	5,000	2,000	...	...	1,000	...	...	12,000
Ferguson, F. H., Wyong ...	2,000	2,000	...	...	1,000	...	...	...	5,000
Ferguson, F., & Son, Hurstville	1,000	1,000	...	...	...	...	...	...	2,000
Rosen, L. P., & Son, Carlingford	10,000	16,000	4,000	1,000	6,000	2,000	1,000	...	40,000
Spurway, F. E., & Sons, Ermington	4,500	3,500	1,000	...	750	250	...	...	10,000
Weare, A. J., Griffith	3,000	4,000	500	...	2,250	100	100	50	10,000
	33,500	42,500	8,500	1,000	16,000	3,850	1,300	50	106,700

INSECT PESTS.

Notes contributed by the Entomological branch.

Red-legged Earth Mites.

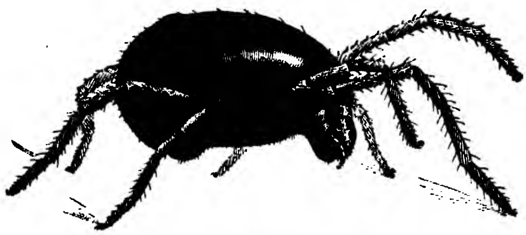
(*Acarina.*)

TWO species of red-legged earth mites occur as pests in New South Wales. The most prevalent and widespread species, *Penthaleus major,* occurs over a large portion of the State, although the districts which appear to be most favourable for its development are the Upper Hunter and North-west Slopes. The other closely allied species, *Halotydeus destructor,* which is sometimes popularly referred to as the "Pea mite" is confined to the southern sections of the State.

Red-legged earth mites have been reported causing damage to crops during the past month, and their attacks may be expected to continue until September.

Penthaleus major was first recorded as a pest in this State in 1921* when it was found damaging oats. It was then popularly referred to as the Blue oat mite, but it is now known that cereals and grasses are not its favoured host plants. The preferred cultivated host plants are lettuce, peas, lucerne and subterranean clover; this mite also attacks turnips, rape, spinach, silver beet, beetroot, etc., and, in addition, may also injure various ornamental flowers, including chrysanthemum, calendula, snapdragon and stock. Amongst the pasture weeds most frequently attacked are Shepherd's purse (*Capsella bursa-pastoris*), variegated thistle (*Silybum marianum*), prickly lettuce (*Lactuca scareola*), and nettle-weed (*Lamium amplexicaule*).

The mites, by feeding on the plants, cause blemishes on the leaves, which typically appear as silvery or greyish patches usually along the main veins. In very heavy infestations the whole leaf surface may be damaged and present a bleached appearance. Seedlings, particularly of lucerne, may be killed outright, and this injury is often mistaken for frost damage. Pronounced damage of this kind is usually confined to late-sown crops which germinate and commence growth under conditions which are too cold to allow them to outgrow the mite injury.



The Red-legged Earth Mite.
(*P. major.*)

Description and Life-history.

The adult mite, which measures about 1/25 inch in length, has a purplish-blue body, and on its upper surface there is an oval, reddish patch, in the centre of which is the anus, and from this a drop of liquid is frequently exuded. The mouth parts and legs are bright red.

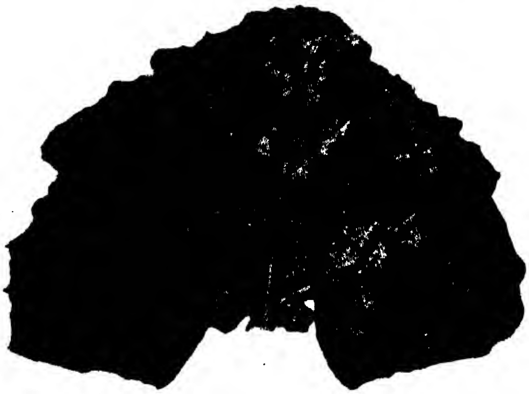
The eggs are laid singly under the leaves, on the soil, on the tops of the leaves or amongst rubbish, etc. They are wrinkled, and vary in colour from salmon to whitish-yellow, but may be darker when wet.

Detailed life-history studies have not been made, but it would appear that there are several generations during the year. The eggs hatch with the beginning of cold weather, but only under suitable moisture conditions, and it is following the first autumn rains that the mites become sufficiently numerous to cause appreciable injury. Little development

*Agricultural Gazette, N.S.W., vol. 33, p. 33.

takes place during the summer. Although some mites may be observed feeding during the day, the majority feed during the early morning or towards sunset. During the day numbers of mites may be found clustering together in the centres of the infested plants or on the surface of the soil under the plants.

The other species of red-legged earth mite, *Halotydeus destructor*, has a velvety-black body and red legs, and is much more active than *Penthaleus major*. It lays its eggs in



Leaf Showing Characteristic Damage Caused by Red-legged Earth Mites.
[*After Swan.*

masses, in a single layer, mainly on the undersides of the leaves of the food plant and mostly where these come into contact with or close to the soil. The surface of the egg is smooth and shining when moist, bright yellow or orange in colour and may have a whitish bloom when dry.

These mites are gregarious when feeding, and are to be found in groups on various weeds, vegetable crops, pastures, etc.

This species may readily be distinguished from the former species (*P. major*) in the field, as it does not possess the reddish patch on the dorsal surface.

Control.

Where vegetable and flower crops are attacked, these mites may be controlled with a white oil and nicotine sulphate spray diluted in the following proportions:—

White oil emulsion: 6 fluid ounces.
Nicotine sulphate: 1½ fluid ounces.
Water: 5 gallons.

A dust which has also been found effective in controlling these mites consists of the following:—

Nicotine dust (2½ per cent.)	..	1 lb.
Tobacco dust (superfine)	..	1 lb.

Treatments with sprays or dusts containing nicotine should be carried out during the warmest period of the day, and a reasonably warm, fine day should be selected for the operation. It is essential to spray or dust the soil below the plants as well as the plants themselves.

Under field conditions an excellent kill of these mites has been obtained with a dust consisting of:—

Carbolic powder	.. ..	1 lb.
Hydrated lime	.. .. ..	4 lb.

This dust is recommended and may be of special value for the treatment of infested ground before sowing a crop. The most effective time for treatment would be two or three weeks after the beginning of the autumn rains.

Grape Vine Mites.

THREE species of mites have been recorded infesting vines in New South Wales. These are the vine leaf-blister mite (*Eriophyes vitis*), the bunch mite (*Tenuipalpus californicus*), and the leaf-rust mite (*Phyllocoptes* sp).

The Vine Leaf-Blister Mite.

This mite is widely distributed throughout the State. It is exceedingly small and has an elongate, white body, which bears two pairs of legs close to the front end.

These mites pass the winter beneath the bud scales, and in the spring emerge and commence to feed on the under-surfaces of the young leaves. The injury caused by their feeding results in the production of small, yellow areas on the under-surfaces of the leaves, but later these become brown in colour and have a felt-like appearance.

The mites breed continuously during the spring, summer and autumn, and many generations are produced during the year, until finally, the mites of the last generation, which mature in the autumn, crawl under the bud-scales to pass the winter.

Usually this mite is not a serious pest, and unless most of the leaves are attacked the cropping of the vines is not seriously affected.

CONTROL.

Control may be obtained by spraying with lime-sulphur diluted at the rate of 1 gallon of concentrated solution to 10 gallons of water. This spray should be applied late in the winter, and its application is particularly desirable in vineyards where mite damage was heavy during the previous season.

Upper:
The Vine Leaf-blister Mite.
Lower:
Under-surface of Leaves Showing Condition Caused by this Mite.

Once the vines have come into leaf, complete control of this pest is very difficult, but their activities may be checked to some extent by dusting the vines with flowers of sulphur, or by spraying with atomic sulphur at the rate of 1 lb. to 16 gallons of water.

The Bunch Mite.

This species is widespread in coastal vineyards and it also occurs in the Murrumbidgee Irrigation Area. These mites are usually found infesting the bunches, but they may also be found on the under-surfaces of leaves which are close to the bunch, although no appreciable damage to the foliage has been noted. The stalks and pedicels of the bunches, however, may be severely damaged, the injury showing as a brownish-black discolouration of the cuticle. This injury sometimes results in the shrivelling of some of the berries, particularly those at the apex of the bunch. The main result of the injury is that the stalks and pedicels shrivel soon after the bunches have been cut and this gives the impression that the bunches have been cut for a considerable time, thus affecting their market value. Occasionally the berries are also damaged, the injury appearing on the surface as a brownish incrustation which sometimes cracks and becomes reticulated.

Although the damage appears to be caused during early development of the bunches, some mites can always be found associated with the bunches right up to the time of cutting.

Grapes Showing Condition Associated with the Bunch Mite.

These Tenuipalpid mites have not actually been observed feeding upon the cuticle, but it seems justifiable to conclude that the damage is caused by them, as the injury is so characteristically mite-like, and the mites are always associated with the condition on the stalks and pedicels.

The Leaf-Rust Mite.

These mites, which appear to be invariably associated with the foliage of the vine, are to be found on both the upper and under surfaces of the leaves, but principally on the upper surface where they may occur in enormous numbers.

It is a widespread species in coastal vineyards, but has not been observed in the Murrumbidgee Irrigation Area.

The mites, when feeding, rupture the epidermal cells of the leaves, thus causing the whole surface to become reddish-brown or rust-like in appearance. Frequently the majority of the leaves on a vine will show this reddish-brown discolouration, and the condition may occur throughout the whole vineyard.

Notwithstanding this, it is doubtful whether the injury caused by this mite is of any great economic importance, for although the foliage may be uniformly discoloured, and the normal functions of the leaves interfered with at least to some extent, the vines appear to yield satisfactorily.

CONTROL.

These mites may be controlled with a lime-sulphur spray (1 gallon to 10 gallons of water) applied just prior to bud-burst.

As an alternative treatment, two applications of colloidal sulphur may be given, the first when the new growth is from 12 to 18 inches long, and the second about three weeks later. The spray should be used at the rate of:—

Colloidal sulphur	1 lb.
Soft soap	2 lb.
Water	50 gal.

If desired, these colloidal sulphur sprays may be combined with the first two Bordeaux mixture sprays, omitting the soap. In districts where severe damage to the bunches has occurred the previous season, growers are advised to use the lime-sulphur 1 to 10 just prior to bud-burst, and to follow it up with one application of the colloidal sulphur spray according to the formula given above.

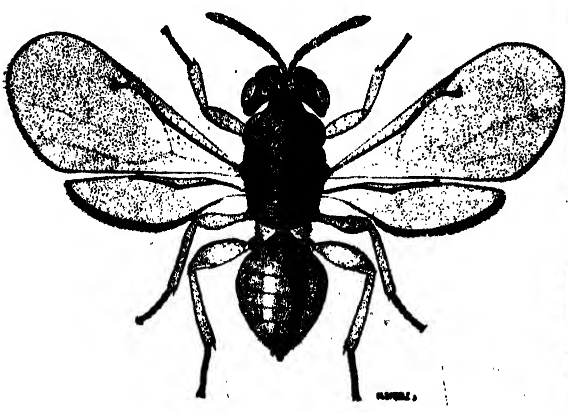
The Citrus Gall Wasp.

(*Eurytoma fellis.*)

THIS wasp is an indigenous insect which normally develops in various kinds of native citrus, but it now infests commercial citrus orchards on the North Coast of New South Wales.

All varieties of citrus trees are subject to attack, but lemons and grape fruit are most commonly infested. The injury is caused by the female wasp depositing eggs within the stems, the deposition of the eggs and subsequent development of the wasp larvae resulting in the formation of extensive galls on the trees. Although the stems are usually attacked, the midribs, petioles and fruit stems are also subject to infestation.

When nursery stocks are infested the main stems may be attacked, the damage



Adult Citrus Gall Wasp.

Galls formed by the Citrus Gall Wasp on a Common Lemon.


IN PEACE
and WAR
Mobiloil
Serves the Nation
on Land, Sea
and in the Air
VACUUM
QUALITY PRODUCT
VACUUM OIL COMPANY PTY. LTD. (Incorporated in Australia)
M34

HELP FOR PRIMARY PRODUCERS

THE head of the present Railway Administration—the Commissioner for Railways, Mr. T. J. Hartigan—who, like his predecessors, has always assisted men on the land to the fullest possible extent, was pleased to learn of the Federal Government's promise to subsidise an important section of primary industry.

So far as this State is concerned the Commissioner's claim is that the railways are indispensable to primary industries. Without the guarantee of reliable, all-seasons and all-weather railway transport, no primary industry of any magnitude could have been established or maintained.

As has been pointed out over and over again, and admitted by representatives of the farmers and graziers, the favourable rates for the conveyance of their products have been a substantial factor in keeping their industries alive. This applies to all primary commodities. Railway freight rates have always been so low that, even when discriminating road haulers were operating, they did not compete for loading which would return little or no profit.

S. R. NICHOLAS,
Secretary for Railways.

then being particularly serious, as the removal of the stems ruins the shapes of the trees.

Life-history.

The adults, which measure about 1/10 inch in length, are small black wasps that emerge from the mature galls in the spring, mainly during the month of October. The life of the adult wasp is short, being of only about one week's duration. They are ready, however, to lay their eggs immediately after emergence, and select for this purpose, young parts of the tree, only a few weeks old, which at that time occur in abundance on the trees. Most eggs are laid during the first twenty-four hours following the wasp's emergence from the gall.

The eggs are deposited between the bark and the wood, and the legless larvae develop and feed within the plant tissues throughout the following summer, autumn and winter, the larval period occupying nine to ten months. Evidence of gall formation does not appear until several months after the larvae have hatched, and the galls continue to increase in size until the early winter.

The pupal or chrysalis stage, which occupies about one month, is passed within the gall.

Control.

The systematic cutting out and destruction of the galls is recommended as a means of controlling this pest. As the life-cycle is an annual one and the galls take some months to develop, it is better to wait until the autumn or winter before removing them, but all should be removed by the end of August. The galls should then be burnt, as adult wasps will emerge from the galls even though the latter have been removed from the trees for several months.

The removal and destruction of the galls during winter should ensure a fair degree of freedom from infestation for several years, as the wasps are not strong fliers and appear to prefer to lay their eggs in the trees on which they themselves developed.

The Example Set by British Dairy Farmers.

MUCH the same challenge facing Australian dairy farmers to-day was taken up by the dairy farmers of England earlier in the war, and they made good in a wonderful way. Think of the odds against them! They, too, had lost many of their best men, though not nearly to the same extent as in Australia. Formerly they had largely grazed their cows on beautiful meadows, and gave them supplementary foods imported from all over the world. Then the war came and those cherished pastures had to be ploughed up to increase the cultivated area of England by over 50 per cent. On top of that the maize and cake from the Argentina and copra from the Islands were suddenly cut off, and the farmers told that they must feed their cows on home-grown fodder.

Thus they were minus most of their meadows and almost all their concentrates, and then were told that they must materially increase production! And the marvel is they did it. What a campaign it was! Land was ploughed that had been pasture for a decade. Water-logged land was drained and derelict country brought back to cultivation. The result — a tremendous increase in fodder crops, much meadow hay and lots of silage.

I saw them gather two harvests. There was a wonderful intensity in the way they went about it. Through the long summer twilight they worked, gathering in the precious fodder for the winter keep of their cows. Tractors and trucks, harnessed to sweeps, pushed up the sweet meadow hay till well nigh midnight. "Civvies" and soldiers worked together with enthusiasm, and lots of girls—Land Army Girls, and ordinary girls—and jolly fine workers they were, too! Yes, they greatly increased milk production in Britain in spite of losing most of their pastures and their imported concentrates. And in spite of what the bomber could do, for remember, this drive was carried out while the Battle for Britain was being fought! And we can do it here, too, despite other severe difficulties. We, too, must depend less on pastures and good seasons and good luck and must grow more green fodder and conserve more in form of hay and silage.—W. S. KELLY, Commonwealth Department of Trade and Customs.

The Enemy Listens . . . . Guard Your Tongue.

NOTES CONTRIBUTED . . . .
BY THE BIOLOGICAL BRANCH.

WOOD ROT OF FRUIT TREES.

WOOD rotting fungi are responsible for an annual toll of the health and productivity of fruit trees. This is the more regrettable because it can be largely prevented.

It should always be kept in mind that the central core of wood in the trunk and larger branches of fruit trees is actually dead tissue, and an ideal medium for wood-rotting fungi to invade. So long as this central core of vulnerable wood is covered with a sheath of undamaged living wood and bark it is safe from attack, but wounds, pruning cuts and sunscalded areas provide points of entry. Once infected the ultimate death of the tree is certain unless prompt measures are taken to arrest the progress of the disease.

The fruiting bodies of most of the wood-rotting fungi are woody or leathery, bracket-like structures, often highly coloured, which develop on the surface of the affected wood. These fructifications produce on their undersurfaces vast masses of spores by which the fungus is spread. The spores are of microscopic size and blow about in the wind, lodging in crevices in dead bark, on cut or damaged surfaces, etc. Here they germinate and produce fungal threads which grow into the dead tissue, ramifying through it, and in time fruiting bodies are produced.

Brackets of the Yellowish Wood Rot Fungus
(*Polystictus versicolor.*)
Developing around a big unprotected cut which has been unable to callous.

Wood Rot Following Re-working.
The yellowish wood rot fungus developing from an unprotected surface beside a strap graft on a re-worked apple tree.

The two most common and serious types are the Yellowish Wood Rot, caused by the fungus *Polystictus versicolor*, and Heart Rot caused by *Schizophyllum commune*. Other locally important types are Red Wood Rot (*Polystictus cinnabarinus*), Die-back (*Valsa leucostoma*) and Pink Limb Blight (*Corticium salmonicolor*).

Yellowish Wood Rot.

The accompanying illustrations show the effect of this disease on the tree. The fungus enters through any exposed surface, and extends along a limb causing a reddish-brown discolouration and blistering of the bark surface and a yellow staining in the wood beneath. This is accompanied by cracking at the junction of the affected and non-invaded parts. The bark and wood eventually die. In cases where trees have been infected for some time, large cankered areas may be present. On the dead parts, greyish or brownish, bracket-like outgrowths, the fruiting structures of the fungus, will develop.

Heart Rot.

Infection by this fungus causes the production of a blackish ink-like stain on the bark, which extends gradually from the point of infection, along the limb. The wood beneath the infected bark is also discoloured. The small, white, fan-shaped brackets of the fungus are produced on the dead areas. The bark may become cracked lengthwise, and ultimately cankered areas are formed, and whole limbs die out. The brackets in some cases do not appear until a year or two after the black stain is noticeable.

Red Wood Rot.

The fungus in this case produces a red stain in affected wood, and the brackets are highly conspicuous, being rather thick and bright red.

Die-back.

The fungus which causes die-back (*Valsa leucostoma*) attacks only trees which have been weakened in some way, such as by root injury. It is, nevertheless, a serious cause of loss, as once infection takes place whole limbs are killed out and the tree further weakened. Entry of the fungus takes place through injuries, or through dead spurs or laterals killed by frost or spray. Infected wood is stained brown, and the overlying bark is darker than the adjoining healthy bark, the infection extending gradually up and down until the whole limb is involved. Gum is sometimes produced between the affected and the healthy parts. Usually the first indication of the disease is the wilting of the leaves on a lateral limb; the leaves die and fall, leaving the bare dead limb exposed. The fruiting bodies of this fungus are inconspicuous—small dark pustules, produced on the dead bark of affected limbs.

Pink Limb Blight.

This disease is readily recognised by the thin, pink incrustation which develops on the bark surfaces of affected parts, in some cases

Heart Rot
(*Schizophyllum commune*)
On a Granny Smith Apple Tree.

Note how the rot has proceeded down the branch from the unprotected cut end shown on the right. Small white brackets are developing on the dead wood.

Heart Rot (*Schizophyllum commune*) Gradually Killing a Granny Smith Apple Tree.

A Peach Tree affected with Die-back, caused by *Valsa leucostroma.*

The fruiting bodies of this fungus are very small and inconspicuous.

[*After Cunningham.*

The Brackets of the Heart Rot Fungus (*Schizophyllum commune*) are Rather Small, Whitish, Furry on the Upper Surface and the Margins are Fluted.

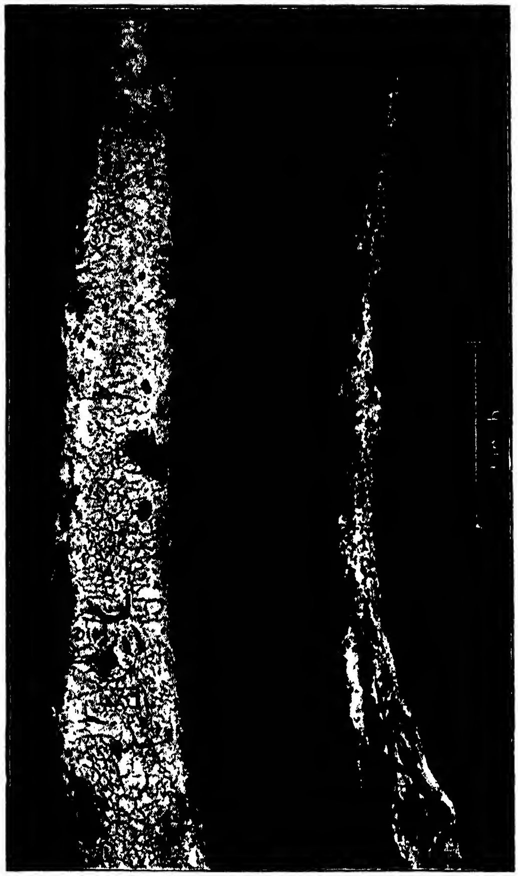
Brackets of the Red Wood Rot Fungus (*Polystictus cinnabarinus*) at the Base of a Main Leader of a Vigorous Peach Tree.

These are a conspicuous bright red.

Sunburn of a Peach Limb.
Note the cracking of the bark and the discoloration of the wood beneath the dead bark.

Stump Grafting by Strap and Bark Graft.
Note the large number of scions used so that callousing is quick, and the foliage left below the graft to protect against sunscald.

girdling the limbs and extending for several feet along them. The bark splits and sloughs off, exposing the wood in extensive cankered areas; the wood may also be involved. As the pink incrustation ages it loses its colour and becomes whitish, and the surface is broken by the development of numerous irregular cracks.



The Branch Blight Fungus (*Corticium salmonicolor*) Produces its Spores on a Smooth Pink Surface which Develops on Affected Limbs.

Control Measures.

Affected limbs should not be permitted to remain in the orchard, as they are a dangerous source of infection. Remove and burn all such material. Quite severely affected trees can be saved by careful tree surgery. All diseased wood should be trimmed away or chiselled out. If whole branches are to be removed they should be cut off flush with the trunk to allow complete callousing and not left as projecting stubs. In cases of

old decay, cavities will be left in the trunk, and these should be cleaned free of rotted wood and filled in with concrete (one part cement to two—three parts sand). Provided the surrounding cut edges of bark are healthy and uninjured, the wound will callous over, gradually covering in the treated part.

The general health of the tree should be maintained at a high level by fertilising and green manuring, so that callousing following cuts or injuries is quick and complete.

Wounds and necessary cuts should be trimmed smoothly and coated with a bituminous paint to protect the vulnerable surfaces against the spores of the wood-rotting fungi.

The cuts made when trees are cut back for stump grafting or reworking are particularly vulnerable, and the officers of the Division of Horticulture stress the need to insert plenty of scions and where possible to utilise strap grafts, so that quick callousing all round the cut will take place.

It is not sufficiently realised that sunburn can cause serious injury, especially to larger limbs and butts if they are exposed by premature leaf-fall following disease or drought, or unsuitable pruning methods. Sun temperatures are extremely high, and the exposed surfaces of large limbs become so hot that local scalding and killing of the bark can be caused. Special pruning methods have been advocated from time to time by this Department for districts where sunburn is specially serious and for varieties which are susceptible to sunburn. Foliage should be left to protect the butts, and a multi-limbed tree aimed at, to encourage dense foliage to protect the upper branches. When trees are cut back for reworking, lateral growth below the cuts should be retained to shade the butt until the new grafts are well established.

Influence of the Bull on Dairy Production.

MANY fine dairy herds are to be seen which consist of cows purchased when young, and it is still the practice of many good dairy farmers to purchase their young stock. These farmers maintain that they can buy better stock than they can rear, and often one has to agree with such a statement. Other dairymen claim that it does not pay to rear calves, when the prices received for fresh milk and pigs sold are considered. This is true, also, in many instances.

The result is that the breeding of stock to meet these demands provides a good source of income for men in a position to supply the need.

There are many dairy farmers, however, who desire to breed stock for replacement on their own properties with the object of increasing the production of the herd per cow and per acre. To such farmers the choice of a bull is a matter of great importance, and when a suitable bull—one bred from a high-production strain—is obtained, the herd should be recorded for production under the Department's scheme. Herd recording goes hand in hand with breeding for production, and young stock for replacements should only be kept from the highest producing cows.

No dairy farmer should have a "scrub" bull in his herd. By a scrub bull is meant one that has not a production record to back him up.

Before a dairy farmer purchases the bull he should provide a bull paddock with water supply (creek, dam or trough) and plenty of shade in which to run the animal. It is a good idea to have a few calves, or a steer or two for preference, running with the bull for company. The paddock should be located near the bail yards so that the cows can easily be taken to the bull for service, or the bull brought to them. On no account should the bull be allowed to run with the herd unless the cows have all been served, because if this is done the bull will, in time, be ruined. If they have all been served, he can be allowed to run with them just for a change and exercise.

By controlling the time of service of the cows, the breeding capabilities of each can be checked, their lactation periods regulated, and the animals given the desired spell before being brought into production again, while a regular supply of milk can be arranged.

(*Continued on page* 348.)

THE POTATO MOTH.

Experiments on its Control.

N. C. LLOYD, Assistant Entomologist.

FOR the past three years research has been conducted into the control of the potato moth. The purpose of this article is to indicate in a general way the scope of the investigations and to summarise the results and their practical application.

The following aspects of the potato moth problem have been investigated:—

1. Life-history studies.
2. Field control by means of insecticides.
3. Field control by means of cultural practices.
4. Control of the moth in stored tubers.

Life History Studies.

In the spring and summer of 1940-41 observations on the life history of the pest in stored potatoes were made at the Department's Insectary, Sydney. They may be summarised as follows:—

Storage in the Laboratory.

Late winter and early spring (August to October, 1940).—

The eggs are laid at an average of two days after emergence of the female moths. A rough surface is preferred, but the eggs may be laid almost anywhere about the oviposition jars. In stored tubers any depression in the tuber is favoured—such as the eyes, cracks due to mechanical injury or under flaps of skin. The eggs may be laid singly, or in groups of up to 30. Females were found to lay an average of 51 eggs each, the maximum number for any female being 92.

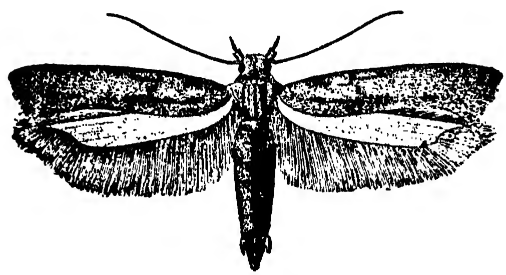
The incubation period of the eggs at the temperatures current (60-65 deg. Fahr.) was 12.6 days, with a maximum of 15 and a minimum of 10 days.

The larvae took an average of 24.6 days to complete development. There is considerable variation in the development rate of larvae where the temperatures are moderate to low. Of larvae emerging on the same day, one may complete development five days before another, in September.

There are four larval instars as determined by measurement of the head capsule.

When the larva has finished development it stops feeding, seeks a sheltered situation, becomes quiescent, contracts somewhat and spins an oval-shaped silken cocoon. In this it remains for a period before pupating. This prepupal period averaged 14.4 days, with a maximum of 17 and a minimum of 12 days. This was in October, at an average temperature of 70 deg. Fahr. In females the pupal period was found to be a little shorter than in males, viz., 14 days in the former, 15.1 days in the latter.

The total life-cycle from egg to adult was found to be 54.3 days in spring. Adult moths were observed to live for a period averaging 12½ days during August and early September.



The Potato Moth.
(*Phthorimaea operculella.*)
[After Graf.

Summer (December and January, 1940-1; average temperature 79 deg. Fahr.)—

Eggs are laid two days after the moths emerge. The average incubation period of the eggs was four to seven days; all hatched in four or five days. Female moths laid an average of forty-eight eggs each, the maximum being ninety.

The larval period averaged 11.7 days, the range being 11-13 days. The prepupal period was one day and the pupal period 8.2 days, with a range of from six to ten days.

The total life cycle in summer in the laboratory was found to average 27.6 days.

Storage in the Shed.

Conditions in laboratory storage differ quite markedly from those in small sheds or barns. Laboratory conditions are marked by a very uniform temperature with a small daily range and very gradual temperature trends. These conditions would obtain in large storehouses and sheds, wharves, ships holds, etc. On the other hand, in small sheds there is liable to be a considerable fluctuation in the temperatures, both from day to day and during the one day. In consequence the life history under these latter conditions is more prolonged.

In the shed at the Insectary in December-January, 1940-41, eggs were laid one to two days after the moths emerged, and hatched in five days.

The larval period averaged 13½ days, with a range of 10-15 days, and the combined prepupal and pupal period averaged 11 days, ranging from 9 to 14 days.

The total life cycle, egg to adult, averaged 34½ days—nearly a week longer than the concurrent experiment in the laboratory.

Optimum Conditions.

This series was conducted in order to ascertain the life history duration under what were considered to be optimum temperature conditions for development, viz., 84 to 85 deg. Fahr.

Eggs are laid one to two days after moth emergence; the incubation period is three days; the larval period is eight to ten days; the combined prepupal and pupal period is seven to eight days (one day in the prepupal stage).

The total life cycle averaged nineteen to twenty days.

Overwintering Observations.

Under Warm Coastal Conditions.—Observations on the over-wintering habits of the potato moth were made during the winter of 1941 at Woodford Dale, on the Clarence River, by Mr. J. A. Wright, Entomologist. Cages constructed of 20-mesh to the inch brass wire were used to keep the various stages under observation.

It was found that development, though somewhat retarded, was continuous throughout the winter months. Adult moths were quite active and lived for about three weeks. They oviposited freely, and the larvae emerged and produced external signs of infestation in tubers within seventeen days. Larval development, though slow, may be completed within six weeks, but generally a longer period was required.

Larvae showed little tendency to pupate in the soil, but preferred to do so in the tubers or in pieces of hessian placed close by. Moths emerged readily from the pupae within four, and possibly three weeks. Mortality among pupae was low.

The minimum period from deposition of eggs to emergence of the moths was approximately ten weeks.

Some heavy frosts and low temperatures were experienced during July and early August, but were insufficient to prevent development proceeding, and it would appear that the insect is quite resistant to low temperatures.

The moth breeds freely in the False Cape Gooseberry (*Nicandra physaloides*) on the Clarence in winter. Other alternate host plants include the nightshades (*Solanum pterocaulon* and *S. nigrum*), the Thorn Apple or False Castor Oil (*Datura stramonium* and *D. tatula*) and the tomato.

In view of the fact that the moth can overwinter on the above weeds, on cull tubers lying on the ground, and on volunteer potato plants, the importance of thorough farm hygiene in reducing the carry-over of the pest to the next season in warm coastal areas is apparent. This, of course, needs to be a co-operative effort; it is of no use for one property to be kept clean while an adjoining one is neglected, as the moths can easily migrate from one property to another.

Under Tableland Conditions.—Some observations at Roslyn, Southern Tablelands, were made during the winter of 1941 by Mr. W. L. Morgan, Entomologist, and may be summarised as follows:—

There is evidence that potato moth can overwinter in the field as well as in the shed. Overwintering takes place in the pupal stage and also probably as the adult. It cannot overwinter in the larval or prepupal stages; neither is there any evidence that it can overwinter in the egg stage. Conditions in tableland areas in winter are too continuously cold to allow the larvae of the moth to feed and develop, even where food in the form of stored tubers is present. In the open, of course, virtually no food is present, all cull tubers lying on the ground being rotted by frost.

Insecticidal Experiments.

These were conducted with the object of killing the larvae and eggs on the foliage. Prior to any field trials being carried out it was decided to investigate the possibility of various spray materials injuring the foliage. The only materials which did so were:— Sodium fluoride 1½ lb., sugar 10 lb., water 100 gallons; sodium fluosilicate 1½ lb. to 100 gallons water, both with and without 10 lb. of sugar; barium fluosilicate 6 lb., sugar 10 lb., water 100 galls (to a much lesser extent); lime sulphur 1 to 60 (slight injury).

Materials which had no harmful effect on foliage included white miscible oil at strengths as concentrated as 1 in 50, lime sulphur at 1 in 80, Bordeaux mixture 1-1-10, lead and calcium arsenate 2 lb. to 40 gallons of water, basic copper arsenate at the same strength and tartar emetic 2 lb., sugar 10 lb. to 100 gallons of water.

Ovicidal Tests.

Tests of various ovicidal sprays were carried out at the insectary early in 1941. The treatments were:—

1. White oil 1 part to 75 parts of water.
2. White oil 1 part to 100 parts of water.
3. White oil 1 part to 150 parts of water.
4. White oil 1 part to 50 parts of water.
5. White oil 1 part to 75 parts of water + nicotine sulphate 1 to 400.

Untreated plants were used as checks.

The results were as follows:—

Treatment 1 gave a 70.25 per cent. kill of eggs.

Treatment 2 gave a 70.37 per cent. kill of eggs.

Treatment 3 gave a 44 per cent. kill of eggs.

Treatment 4 gave a 70.73 per cent. kill of eggs.

Treatment 5 gave a 88.83 per cent. kill of eggs.

In the untreated eggs there was a mortality of only 4 per cent.

White oil at a strength of 1 to 50 gave no better kill than that given by a 1 to 100 spray. The addition of nicotine sulphate increased the kill by nearly 20 per cent. It would appear, then, that an oil spray of 1 to 75 or 1 to 100 plus nicotine sulphate 1 to 400 is the most effective ovicidal spray.

However, there are drawbacks to the use of purely ovicidal sprays on a field scale, amongst which are the difficulty of reaching all the eggs and the expense entailed in frequent applications.

Experiments at Millthorpe, 1942.

Early in 1942 two spraying and dusting experiments were commenced at Millthorpe, on the Central Tablelands, with the object of determining whether any substantial reduction in infestation of the foliage could be obtained, whether such a reduction would lead to a reduced infestation of tubers in the ground, and also whether there was any effect on yield due to any of the treatments.

Potato Tuber Showing Damage by the Larva of the Potato Moth.

The treatments were as follows:—

Experiment 1.

1. Lead arsenate 2 lb. to 40 gallons of water.
2. Basic copper arsenate 2 lb. to 40 gallons of water.
3. Calcium arsenate 2 lb. to 40 gallons of water.
4. Lead arsenate 2 lb. to 40 gallons of water, plus white oil 1-75.
5. Bordeaux mixture 1-1-20.
6. Bordeaux mixture 1-1-40.
7. Check-untreated.

Experiment 2.

1. Nicotine sulphate 1-400 + white oil 1-75.

2. Nicotine sulphate 1-400 + soft soap ½ lb. to 10 gals.

3. Lead arsenate: kaolin equal parts.

4. Calcium arsenate: kaolin equal parts

5. Derris root 1 part, kaolin 4 parts (containing 0.94 per cent. rotenone).

6 Derris root 3 lb., water 100 gallons.

7. Colloidal copper spray containing copper sulphate at the rate of 1 lb. to 32 gallons.

Each treatment was replicated 7 times. Four applications of each treatment were given, the first 3 to 4 weeks after the plants appeared above ground and the others at intervals of 13, 17 and 21 days thereafter, respectively. Results were estimated by counting the number of larvae present in a certain number of plants sampled from each plot. Three counts were made at different stages during the growing season.

RESULTS OF EXPERIMENTS.

The derris dust and derris spray were greatly and consistently superior to all the other treatments. Their superiority increased as the season progressed, until in the final count infestation was only one-sixth of that in the nicotine-soap treated plots (which virtually amounted to control or check plots, so inefficient was the treatment).

It is not proposed here to give a detailed statement of the figures in each count, but the following comment may be made:—

Experiment No. 1.

1. *Lead Arsenate Spray.*—This gave little promise, only about 42 per cent. control being obtained. Better control may be obtained by a greater concentration and twice the strength used in the experiment could be employed without making it any more expensive than derris, at 3 lb. to 100 gallons, but whether any further degree of control would be obtained is open to doubt.

2. *Basic Copper Arsenate Spray.*—Gave consistently better control than lead arsenate, averaging just over 50 per cent. No spreader was incorporated, and the powder tended to settle rather rapidly out of suspension. With a spreader it may be worth a further trial, for it appears the best of the arsenicals as a spray, if not as a dust. It is an expensive material, however, and would have to be considerably more effective than lead arsenate to justify the additional cost.

3. *Calcium Arsenate Spray.*—This was inferior to basic copper arsenate at all three counts and to lead arsenate at the last two counts. The degree of control ranged from 19 per cent. to 34 per cent. only.

The powder settled fairly rapidly out of suspension, so that the addition of a spreader is essential. It is considerably more expensive than lead arsenate, and is therefore of little promise.

4. *Lead Arsenate-White Oil.*—This treatment gave a control of from 54 per cent. to 60 per cent. and was the most effective treatment in experiment 1. The oil, as well as acting as a spreader for the lead, has an ovicidal value of its own. It was superior to lead arsenate alone, and slightly superior to basic copper arsenate. It is an expensive treatment, however, and the degree of control did not justify the cost.

5. *Bordeaux* 1-1-20.—There was a low degree of control, 30 per cent. to 36 per cent. in the first two counts, but in the third count, 69 per cent. control was observed, the highest figure obtained in experiment 1.

6. *Bordeaux* 1-1-40.—Up to the last count there was no difference in the controls given by this treatment and the stronger Bordeaux. However, in the last count, this treatment gave 55 per cent. control as against 69 per cent. in the 1-1-20 Bordeaux. It seems that after repeated applications, an accumulation of copper is formed on the leaves, which greatly checks oviposition, or, possibly, larval development.

In all treatments with copper as the active constituent, this slow cumulative effect was noticed, giving a fairly high degree of control at the end of the experiments, but a low degree in the intermediate stages.

7. *Control.*—In all counts a significant decrease in larval infestation was shown by all treatments, in comparison with the untreated plots. No treatment, however, reduced infestation to such an extent as to be considered a practicable means of control.

Experiment No. 2.

1. *White Oil-Nicotine Sulphate.*—A worthless treatment, giving little or no reduction in infestation as compared with the untreated plots in experiment 1.

2. *Nicotine Sulphate-Soap.*—No better than the previous treatment, and these two may safely be discarded. Contact insecticides alone are of no value unless applied very frequently. These two treatments were used as controls in assessing the degree of control obtained by other treatments in the experiment.

Young Potato Plant Showing Damage to Haulms by Potato Moth Larvae.

3. *Lead Arsenate-Kaolin, equal parts by weight.*—Gave 50 per cent. control, and was slightly better than the lead arsenate spray, but very much more lead per acre was used in the dust form. Control was insufficient: a 75 per cent. lead dust may be worth a trial.

4. *Calcium-Arsenate-Kaolin, equal parts.*—After a good start this treatment proved disappointing, control dropping from 63.8 per cent. to 30 per cent. It was definitely more effective than the calcium arsenate spray, but could not be recommended as against lead arsenate dust.

5. *Derris-Kaolin, 1 to 4 by weight.*—Gave very good control ranging from 70 per cent. to 82.7 per cent. in comparison with treatments 1 and 2. In both experiments it was greatly superior to all other treatments, except derris spray.

6. *Derris, 3 lb. to 100 gallons.*—As good as derris dust, control, ranging from 70 per cent. to 85 per cent. At each count the degree of control exercised by the derris became more marked, as follows:—

PER CENT. CONTROL.

	1st Count.	2nd Count.	3rd Count.
Derris dust	70	76·3	82·7
Derris spray	70·8	75·8	85·3

7. *Colloidal Copper Spray.*—Much the same remarks apply to this treatment as to 1-1-20 Bordeaux, and its performance fairly closely approximates that of the Bordeaux. It has been found to protect tobacco seedlings against oviposition by potato moth, but in the field it seems to have no particular merit as compared with Bordeaux, besides being somewhat troublesome to prepare.

Effect of Treatments on Tuber Infestation.—There was no noticeable reduction in infestation of tubers due to any of the treatments. This was to be expected with small plots of a few square yards each situated amid surrounding acres of untreated plants. However, where the whole area is effectively treated, the lower infestation of the tops must lead to lower tuber infestation.

Effect on Yield.—Calcium arsenate spray and 1-1-20 Bordeaux mixture showed a tendency to reduce the yield. There was no observable increase in yield due to reduction in moth infestation—damage to the plants was not severe enough.

A Bordeaux Mixture Experiment.

A small experiment was carried out concurrently with the above experiments, using Bordeaux mixture at strengths of 1-1-10, 1-1-20, 1-1-40. It was found:—

1. Bordeaux mixture has a considerable though slow-acting effect in reducing infestation.

(*Continued on page* 337.)

Viticultural Notes.

H. L. MANUEL, Viticultural Expert.

Preparations for Planting.

In selecting ground for the planting of a vineyard, avoid shallow soils, and preferably choose soil which is of such nature that it can be turned over or trenched to 12 inches or more. Shallow soils, particularly those overlying poor clay subsoils, only lead to disappointment if planted with vines. Trenching these soils would bring too much clay to the surface so that they could not be worked satisfactorily. Planting on these types of soils means "pot hole" planting, which is a failure.

Preparation of the land by deep working prior to planting is the only way to establish a vineyard which will see old age, and give economic success. Trenching is better than subsoiling, the effect of which is more or less temporary, as one only stirs up the subsoil, and in time it runs together again.

The use of trenching implements mixes the surface soil (which is more fertile and of better texture) with the subsoil to the depth of the vine roots, and this prevents the roots surfacing, where they would suffer from dry conditions and continuous cutting by the ploughing operations.

Subsoiling implements could be used with advantage during the winter in vineyards that have been established for many years, and show signs of weakening. I do not suggest its use in narrow-planted rows, but in ordinary trellised areas.

The subsoiling could be carried up the centre of the rows, going down to a depth of 15 to 18 inches if one has the pulling power; and fertiliser applied along the subsoiled furrows.

Should one not be prepared to risk subsoiling every row centre, alternate rows could be worked one year and the remaining rows the following year.

Only the centre of the rows should be subsoiled and not the whole of the rows, and although this may cut some of the roots, fresh roots will form and should rejuvenate the old vines to some extent. Subsoiling should not be regarded as an annual operation, but only used in cases where vines appear to be slipping back.

Pruning the Vines.

Although June and July are the two principal months for the pruning of grape vines, the season is, at times, commenced in May in large vineyards, because of the shortage of pruning labour. Where it is possible, however, it is preferable to allow the leaves to fall from the vines and the wood to harden before starting.

The two principal methods of forming young vines are:—

(1) The bush, staked system, with which the vines are pruned to spurs.

(2) Spalier systems in which two arms are formed, one on either side of the stem and the vines trellised.

Spaliers are formed for annual rod and spur pruning, and also to carry spurs. This system is fairly extensively used for table grapes such as Muscats.

A third system (the cordon), which has only one main arm trellised horizontally, is simple to form, but it is not recommended except in special circumstances and in some instances under rich soil conditions. Under ordinary conditions it is far better to have the two short permanent arms.

In the forming of young vines the inexperienced grower sometimes makes the mistake of leaving the young arms long. The best practice is to extend the main arms gradually each year until the desired length is reached and not endeavour to obtain the full length in one year or two years. By this gradual lengthening a more even break of the buds along the young arms is secured, and it is possible to choose and space the spurs at regular intervals when pruning.

Selecting Cuttings for Spring Grafting.

During the pruning period cuttings should be selected and held for the spring grafting of any phylloxera-resistant stocks that have missed the yema bud. The cuttings should be preserved in soil, preferably sand, which must neither be too moist nor too dry.

In small areas and under favourable conditions certain vines can be left until August, and the scion wood taken directly from the vines and used almost immediately for grafting.

PRUNING THE DELICIOUS APPLE.

J. V. McGRATH, Fruit Instructor.

THE Delicious apple, which originated in America about 1880, has grown in popularity for dessert purposes with the public of Australia, more rapidly than any other introduced or locally-raised apple.

Due to its popularity this variety has been planted in fairly widely distributed areas of the State. It has been found, however, that, unlike the Granny Smith, for instance, the trees are fairly exacting in their requirements if fruit of a prime quality is to be produced. A combination of good soil and suitable climatic conditions is necessary.

The fruit-growing districts of Orange, Batlow, and Armidale are eminently suitable for the growing of Delicious, and fruit produced in these districts is unsurpassed for appearance and flavour by that from any other part of the State. In these districts extensive areas have been planted to Delicious, and the area is being increased each year while many undesirable varieties have been reworked to Delicious.

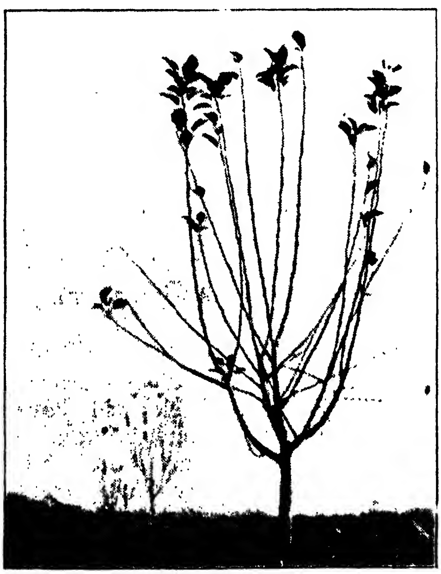


Fig. 1.—A Young Delicious Apple Tree Showing Satisfactory Development.

When Delicious trees are planted in suitable localities, the trees make vigorous growth and can be developed into well-shaped productive trees. (*See* Fig. 2.)

The tree can be classed as medium upright in habit of growth, and not difficult to train to a desired shape. The open centre type of tree is still the accepted mode of training in practice in this State. It has, generally speaking, given satisfaction, and there does not appear to be any sound reason for advocating a change to other systems.

Treatment of Young Trees.

At planting time, if the trees are "whip sticks," they should be headed back to about 15 inches from ground level.

The first few years are devoted to the

developing of a tree with well spaced limbs set on a broad base (Fig. 1). To achieve this, some fairly hard cutting back of leaders is necessary. Every effort should be made to stagger the limbs in order to avoid weak crotches and bottle neck constrictions which will, at a later date, result in weak and broken limbs.

The number of limbs developed in a Delicious should be fewer than in a Granny Smith. On an average, a good tree is capable of carrying about fifteen to twenty main and secondary limbs. After the main framework of the tree has been formed, pruning treatment can be modified.

Treatment of Leaders.

The annual growth of leaders and secondary limbs should be shortened back, according to the vigour of the tree. The length of growth removed should be sufficient to prevent the limbs from outgrowing their strength, and hard enough to force out lateral growths from the remaining leaders, the aim being to furnish the main and secondary limbs with adequate material which can subsequently be developed into small branches or "arms," which, in turn, will later develop fruit spurs. Note the satisfactory furnishing along main limbs in Figs. 3 and 4. Fig. 4 shows the treatment of leader growth.

Treatment of Fruiting Wood.

In the handling of the fruiting wood, the grower should aim at developing fairly stout fruiting arms, spaced at intervals along the main and secondary limbs. The foundation for these growths is laid down in the treatment of laterals (Fig. 4). If the Delicious is pruned too lightly when the trees are young, it will be found that a fair number of spurs develop directly out of the main limbs. The spurs carry fruit and are useful for a few years, but as the tree develops, they often weaken, and quite frequently cannot be renewed.

Vigorous laterals which develop along the main limbs should be shortened back to within about 8 inches of their base (see upper section of limb in Fig. 4). Only in very odd cases, where the laterals have developed very close together, will it be found necessary to remove any.

Weak laterals or spurs should not be touched. This is important, because if a weak lateral is shortened or even tipped, it will very seldom develop into anything better than a weak spur cluster. Allow it to remain untipped, and in most cases it will grow into quite a fair-sized lateral, capable of being developed into a useful fruiting arm.

Fig. 2.
A Delicious Apple Tree in Production.

Handling Mature Trees.

The vigorous laterals which are shortened back will have probably developed two weaker laterals and perhaps a spur or two during the subsequent year. If both laterals are fairly strong, they should be shortened back to within about 3 or 4 inches of the previous season's cut (Fig. 4).

In some cases one strong and one very much weaker lateral will come away at the

end of a shortened lateral. In this case the strong lateral should be shortened back and the weaker lateral allowed to remain untipped.

Weak laterals growing from the main limbs which make sufficient development in

Fig. 3.—Limb of Delicious Before Pruning.

the subsequent year should be cut back in order to develop them into healthy, fruit-bearing arms.

It will be found in the course of a year or two that the arms will settle down to the development of fruit spurs with odd weak laterals. Any strong laterals that may develop should be shortened back fairly hard, and the weak laterals allowed to remain untipped. Fruiting arms developed in this way will carry on for a number of years. They can be prevented from extending too far, or rejuvenated, by cutting back to a lateral in a favoured position and not tipping the lateral for a season. It is a good practice, where possible, to allow a weak lateral to go untipped at or near the end of the fruit arm in order to obtain the reinvigorating effect exerted by the terminal bud.

When the trees have settled down to regular bearing, there is a tendency towards alternate cropping. This failing can be countered to a large extent by a judicious thinning out of some of the subdivisions of spurs when they have become overcrowded and "staggy" and lack new healthy growing "tips."

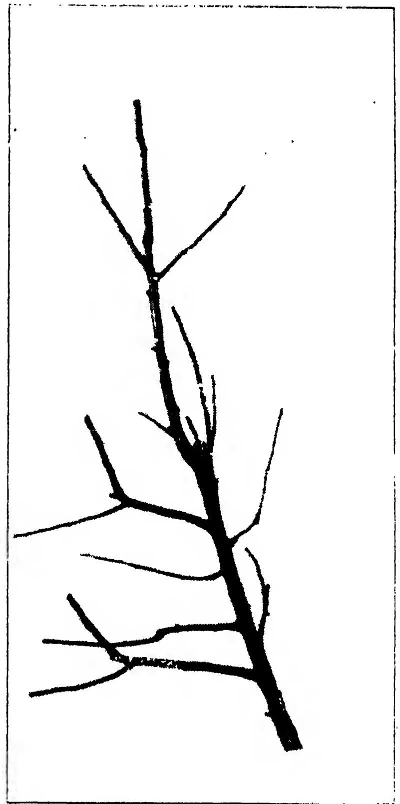


Fig. 4.—The Same Limb After Pruning.

Damage by Hares.

During last winter hares did considerable damage to young apple and pear trees in various parts of the State, particularly in the New England area. The best protection, of course, is to have the area of trees properly protected by wire netting, but if this has not been done, the following mixture prepared and applied as under will give satisfactory results:—

1 oz. bitter aloes.
1 lb. common soap cut up fine.
1 gallon water.

The ingredients should be boiled for about twenty minutes, and, when cool, applied to the butts of trees with a brush or swab. If the young trees have been headed on the low side, it will be necessary to swab the lower portions of the limbs as well as the butt, as hares can reach a distance of about 2 feet 9 inches from the ground.

Apple Powdery Mildew.

Pruning as an Aid to Control.

POWDERY mildew was very much in evidence in many districts during the past season. In the New England area, Jonathan trees in particular were badly infected with the disease.

Growers are reminded that pruning is an important "step" for the control of this fungus, and during the winter pruning all infected twigs and terminal buds should, as far as possible, be cut out and destroyed by burning. Later the trees should be sprayed as recommended by the Department; particulars of this treatment may be obtained from the Under Secretary and Director, Department of Agriculture, Sydney.

Replanting of Citrus.

Soil Fertility Must Be Built Up.

OCCASIONALLY it is more economical to dig out and replant a section of land than to continue with an area from which a number of trees are missing or which carries old weak trees of an undesirable variety. It is a widely recognised fact, however, that citrus trees are gross feeders and always thrive best on newly cleared land. Old ground can only be successfully replanted if every care is taken to restore the soil to approximately its original condition. Unless this is done—and rebuilding fertility into land is a gradual and expensive process—subsequent tree growth is slow and weak, rendering the trees susceptible to injury from frosts, excessive rains and other causes of unsatisfactory development.

As a rule, the most vigorous varieties should be used in preference to weaker growing ones. For instance, Valencias might be given preference to Navel oranges, and Lisbon lemon to Eureka. Lemons are generally more likely to succeed than oranges.

It will be an advantage if a couple of years can be allowed to elapse before replanting, the opportunity being taken to grow crops of a bulky nature and plough them deeply in. These crops should be well manured to ensure maximum growth.

Plant Between Old Tree Sites.

The new tree sites should be arranged to occupy spaces midway between the locations previously occupied by trees. Greater success will be ensured if wide holes are excavated and filled with new soil. If this is not practicable, a generous application of sheep or other animal manure should be dug deeply into each tree location a month or two before planting.

During the first year or two after replanting, eradication of weeds during dry periods should be restricted to narrow strips of land along each row of trees. The remainder of the land should be used for continuing the growth of heavy crops, to which generous quantities of fertilisers with a high nitrogen content should be applied.

If replanting soon after removal of the original trees is necessary, similar practices should be followed. Everything possible should be done to assist rapid establishment, which is difficult enough even when every care is taken.

In cases where a missing tree in an orchard is to be replaced, even more care is necessary, for usually there is constant competition by surrounding trees. The square of land in which the young tree is planted should be dug around occasionally, and the root spread from adjacent trees checked. An occasional watering will also be necessary.—R. J. BENTON, Special Fruit Instructor.

Pasture Stability in the Western Division.

Causes of Deterioration and Methods of Reclamation.

(*Concluded from page* 284.)

THE June issue contained extracts from a report submitted by Mr. E. A. Elliott, Sheep and Wool Expert of the Department, following a series of visits to the Western Division of the State. These set out the causes of deterioration that has occurred in that area in a number of instances.

This month, further portions of the report are quoted, including those dealing with methods of reclamation of country which has suffered erosion and deterioration of pastures as the result of present methods.

Reclamation.

The reclamation of deteriorated country should be considered from the aspects of :—

1. Better spacing of watering places and better use of them;
2. Management of the properties.

The Water Supply and Its Location.

The consensus of opinion among those qualified to speak by knowledge of the conditions, is that an increase in the number of watering places makes for better use of the land. Water should be available so that all the feed is accessible. Instances were seen where, because of the distance from water the area had been without stock for long periods, in some cases extending into years.

By increasing the number of watering places on a property the stock can be spread more evenly or they can be moved to a different paddock if it is seen that their paddock, especially adjacent to the water, is being eaten out and trodden into a condition suitable for erosive action by wind and/or rain. In addition, with sufficient watering places a system of rotational grazing can often be practised. It is considered that soil denudation would be decreased to a very considerable extent if water supplies were closer together.

Landholders are in agreement that sheep can walk at least 2½ miles to water, which means that water supplies should not be more than 5 miles apart. In summer time stock drink more frequently, and with insufficient watering places, the country adjacent to the supply becomes particularly subject to action by wind and rain. One authority claimed that any additional water supplies in the way of surface tanks should only be large enough to allow the stock to

An Enclosed Area at Ivanhoe.
Showing the growth that occurred in eighteen months.

eat the feed available; otherwise the owner would be encouraged to hold the sheep too long because there was still plenty of water available. This claim is subject to question, and by far the largest weight of opinion is for larger, deeper, and so more permanent supplies. In one district visited there had not been sufficient rain in one fall to cause water to run in the previous 15 months. It appears very necessary to conserve as much water as possible where the rainfall is so light and where the evaporation during summer is so excessive.

Tanks should be deep—12 to 16 feet was generally accepted as being suitable—with steep sides. With only a small supply which gives out early in the year, advantage cannot be taken of the benefit of showers and light storms on adjacent country.

Sources of Water Supply.

The provision of adequate water supplies on a property may mean considerable expense. Various methods are available. In the artesian belt, water is secured by boring to about 2,000 feet and it is not necessary to have a mill. The supply is variable, in many cases being sufficient only for paddocks in the immediate vicinity, whereas in others the watering of paddocks for 10 or more miles in several directions by open drains is possible.

In other areas sub-artesian water is available at depths ranging from 200 to 800 feet. The water has to be lifted to the surface and storage tanks and troughing supplied, so that the equipment of such a supply may cost approximately £400 in addition to the cost of boring at say £1 per foot. This type of supply is very satisfactory so long as the mill and other equipment are kept in good order.

Where water is not available from the above sources, a supply of surface water must be secured. In some areas, because of the loose nature of the soil, a satisfactory run off is only possible with heavy rain; this is the case in portions of the Brewarrina and Walgett districts. Then there are areas where it is difficult to find ground which will hold water. Where scalded plains or clay pans are present they are often put to good use as water catchments for a near-by tank. On the flat country the site and catchment must be very carefully selected so that all the water available can be collected. Cases have occurred in which tanks have been sunk and when rains came, the water did not run into the tank. A satisfactory size tank to last through a dry period would be 10,000 to 15,000 yards.

A good tank of the size stated may be considered as an almost permanent supply and its cost in relation to the running of the property, therefore, should be spread over a number of years. The cost of excavation is approximately 1s. per yard.

The Main Street of Tibooburra.

A mill, supply tank and troughing are not essential, but desirable, particularly in soil which is inclined to become loose. The bank of a tank is a favourite camping place for sheep. In the Western Division surface tanks become silted up to a greater extent than in other parts of the State and this habit of the sheep accentuates the silting process, so the advantage of keeping the stock away from the tank can be readily seen. Desilting of tanks is fairly expensive, in addition to which plants for carrying out this work are not always readily available.

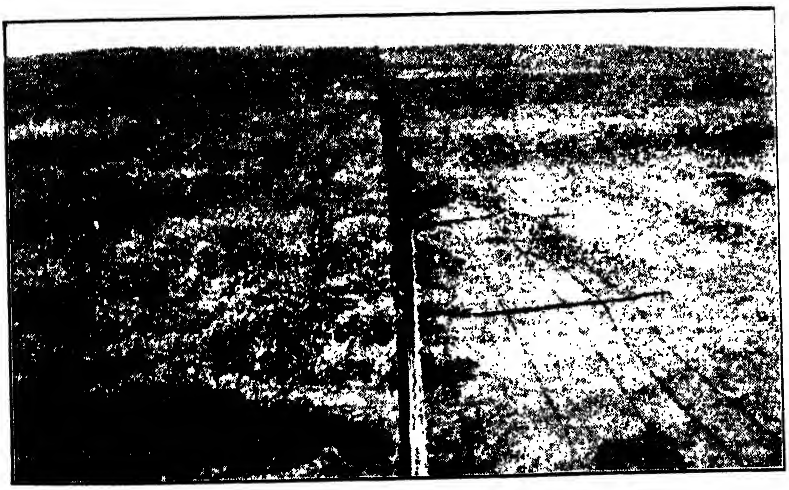
Owing to the difficulty of getting water at the back of one property, four series of pipe lines were put down and pumping plants installed at a cost of £6,000, the water being taken 8 miles from the river.

If additionals are granted, great care should be exercised to ensure that water can be secured economically.

The Influence of Management.

There can be no question that the management of a property in the Western Division is the deciding factor for success or failure. There are many other considerations in addition to the provision of adequate water supplies.

The carrying capacity in the various sections of the Western Division have been estimated and are recognised as being very satisfactory. They vary from one sheep to 2½ acres in the best portions of the Walgett District to one sheep to 30 or 35 acres along the South Australian border south of Broken Hill. A first and very important point in regard to management is to adhere strictly to the rated carrying capacity.



A Demonstration of the Value of Excluding Stock for a Period at Broken Hill.
Left: Area from which stock have been excluded for five years.
Right: Area stocked normally.

A large proportion of the failures in the Western Division have been caused through allowing the stock numbers to build up above the recognised number for the property. This, in a good season, may not have any apparent damaging effect, but every time it is repeated the recuperative power of the pastures becomes less. With overstocking there is less chance of any seeding taking place and this is essential where the rainfall is so meagre.

Cases have occurred in which lessees have increased the sheep numbers enormously in good seasons. Action similar to this will soon cause deterioration to the property The figures for one district for 1941 can be quoted. With a rated carrying capacity of 773,619 sheep, rates were levied on 6,847 head of large stock and 997,561 sheep, or with large stock rated at one to ten sheep, 1,066,031 sheep. The year was only an average one, so in a good year much greater numbers might have been put on. Actually during the year 3,000 large stock and 200,000 sheep left the district, showing that the owners realised they were overstocked.

The methods of one settler west of Ivanhoe may be quoted as a first-class example of pasture management. On a property of 40,000 acres subdivided into twelve paddocks, at least two paddocks are left entirely without stock from July until early summer each year. This ensures that seed ripens and falls in two paddocks yearly. As the "spelling" is worked in rotation each paddock is allowed to seed once in six years. No matter how dry the season is there is usually some vegetation which grows and seeds. This settler is also very careful to keep his numbers within a safe margin by keeping to the normal rating of the property. Such a system has much to commend it, and if generally adopted would help considerably towards the continued stability of this section of the State. Actually many station managers regularly spell portions of their area for varying periods, depending on seasonal conditions, with very beneficial results.

Many owners claimed that their areas were not large enough to allow of paddocks being spelled. If such is the case, either their

management is at fault or the area under their control is not large enough, and the faults should be corrected.

There are many difficulties in the way of carrying out this type of reclamation on private properties. Firstly, it is necessary to ascertain how long the area must be closed for any lasting benefit to result. In one area of sandy country with thin mallee which, because of lack of water, had been unstocked for fifteen years, no improvement could be seen over adjoining country. It was claimed by some that if an area was closed from stock it would quickly be overrun by rabbits and kangaroos in a good season, and after each fall of rain. In the area between Ivanhoe, Cobar and Wilcannia there is great danger from fires if country is left unstocked after rain.

The Dillon bush is considered by some authorities in this area to be the greatest factor in bringing windswept country back

Dil on Bush at Wentworth.

to production. It grows quickly, is hardy, and though good sheep feed, is armed with many thorns and so is not readily eaten down. As the bush grows it holds the drifting sand, and eventually other shrub growths and grasses appear in the shelter of the Dillon. Instances were seen where the soil level had been raised 5 feet above the original clay pan. This bush is seen more in the Wentworth than in other districts.

Other hardy shrubs found in the Western Division are Indigo bush and Blue bush; both fair sheep feed though the latter has been known to poison sheep if not used to it.

The state of the pasture and the kind of growth present will have a decided bearing on the time required for reclamation. If it is principally Copper burr or similar types of growth, we can assume that the improvement will be through various salt bush species and other shrubs, and as the soil is being more firmly held, the various types of grasses.

In many areas of the south-western and western parts of the Division the Copper burr and allied species is probably the most common plant growth and is considered as a valuable feed for sheep. Some species are eaten readily.

The rate of improvement in some situations or soil types may be relatively fast, flats sheltered from the west by belts of timber for example, while in the sandhill and light Mallee soils if any rejuvenation eventuates it would be very slow. One interesting example of reclamation was seen near Cobham Lake, south of Milparinka. An area which in 1924 was an extensive clay pan began to be covered with sand and dust in 1929. It is now a nice flat and when seen recently was covered with a growth of various grasses.

In the north-west corner of the Division spelling of the country is not considered to be economical because of the scarcity of fencing timber and high freight charges for wire, iron posts, etc., required for subdividing the property. The stony downs country which comprises a good portion of the area is not so subject to wind erosion as the sandy soils, and it grows excellent Mitchell grass. At the same time it must be recognised that as a general rule, country will respond to resting and wherever possible this system of pasture management should be adopted.

In many parts of the Western Division timber is very scarce. In such cases there should be a heavy penalty for falling any growing timber. Though it may be useless as fodder and little value as a shade, every growing tree or shrub is helping to hold the soil and so resisting soil erosion.

Fence posts are vital in these areas, and every facility should be given in the way of freight concessions to allow settlers to procure iron posts for this purpose. Freight is a very expensive item for the settler in the outer portions of the Western Division, and it is in the interests of the country to see that these costs are kept as low as possible.

Conclusions.

The stability of the Western Division is almost entirely a matter of careful management. Given an area of sufficient size—and

this will, of course, vary depending on the particular part of the Division—sufficient finance to subdivide into enough paddocks, provide water in each, purchase stock and stand a bad season, a settler should have no cause for concern.

Having sufficient water will allow all the country to be utilized if needed, and the areas round the water will not be unduly trodden out.

A reasonable carrying capacity must be decided on, and the lessee prevented from stocking above that capacity at any time no matter how good the conditions are, all surplus sheep being disposed of yearly at a definite age.

The area should be sufficient to allow of at least some portion each year to be free from stock so that seeding of the pastures will occur. Additionals should be granted carefully. In the Walgett district settlers claim that portions of their country cannot be properly utilized because of the distance from the main block.

The most important point when opening up this country for settlement is to select men who know the country and are prepared to live in it.

A Soil Fertility Improvement Act.

MANY principles are nowadays being questioned, many standards more critically examined, but there is no principle more open to challenge than the assumption that land ownership implies complete freedom as to the way in which it shall be used, and there is no standard more clearly calling for improvement than that of the practice of a large proportion of land users. Closely related to the problem of its improvement, is the influence of present tenant- and share-farming conditions; and the Agricultural Holdings Act, 1941, which becomes operative this month is essentially a recognition of this fact.

Designed to correct certain inequities in the existing farm tenancy systems and to regularise them generally, the Act has the wider object of correcting also the trend to those soil-exhaustive methods which prevailing conditions invite. Full recognition is given by the Act to the legitimate interests of both parties, but the accent of this legislation is rather on mutual interest and the interests of that party not hitherto considered—the nation itself. It aims to introduce into agreements for land use an element of social responsibility, and, by the encouragement of the type of farming programme which a permanent agriculture demands, to safeguard the soil's fertility for the benefit of farmers still to come.

The provisions of the Act and their operation in practice are the subject of an article by Mr. A. W. S. Moodie, which is appearing serially in the *Gazette,* sections having been published in the May and June issues. A further instalment appears this month on page 303, and others will follow in subsequent issues.

The Potato Moth.

(*Continued from page* 327.)

2. The use of Bordeaux mixture at a strength greater than 1-1-40 was not justified by results.

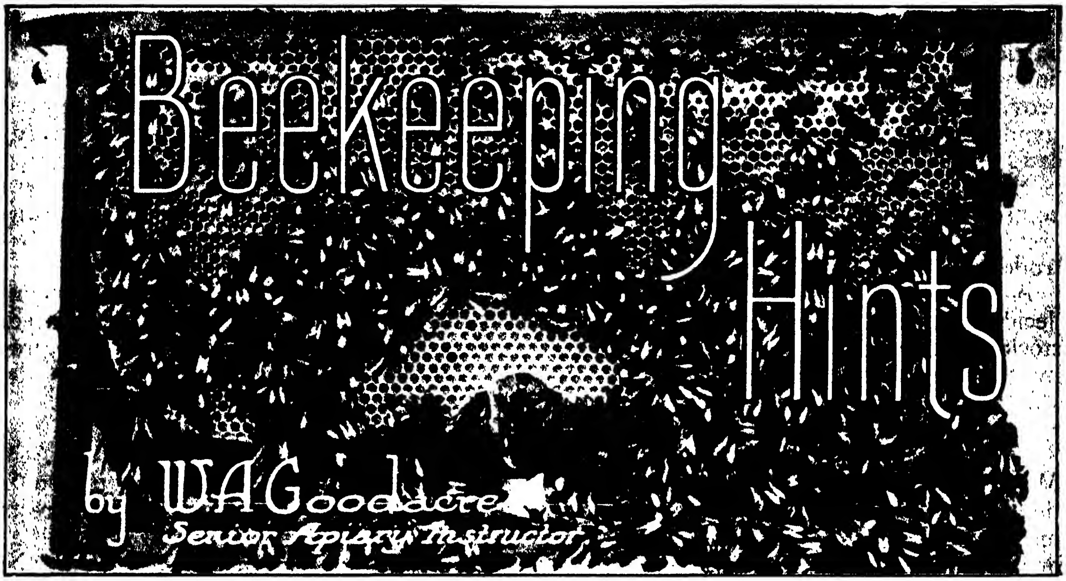
3. Potato foliage stands up well to a 1-1-10 spray, though there was possibly a slight reduction in yield at this strength.

Summary of the Insecticidal Experiments.

Derris was the most effective material used. On a cost basis the spray worked out cheaper than the dust, but with large-scale dusting machines, the reverse may be the case. Spraying has certain disadvantages, such as the need for large quantities of water and the trouble of carting this all over the paddock. Either treatment may be recommended according to the facilities available. Insecticidal treatment seems at present most applicable to coastal conditions where very severe top infestation may occur, involving the death of the plants.

(*To be continued.*)

: : : : CARELESS TALK COSTS LIVES : : : :



The Queen Bee

Does Not Rule the Hive.

MANY people other than students of bee culture believe that the queen bee is the ruler, or at least the leader of the colony. It is thought, for instance, that when the swarm issues from the hive she is the leader of it; and if, when the swarm forms a cluster, the queen can be found and placed in a cage in an empty hive, the bees will follow her; and so on. These ideas are, of course, not correct. Great care is taken by the worker bees to safeguard the queen to ensure her presence in the hive, and everything possible is done to provide for her welfare, but the requirements of the colony under all circumstances influence the movement and services of the queen.

The Queen and Swarming.

The preparations for swarming are carried out by the worker bees, and the bees issue from the hive when suitable outdoor conditions obtain. The queen accompanies the swarm, either early or late in the issue according to her convenience; there is certainly less risk in following this course than if the queen lead the way. It is left to the flying bees to select a place on which to cluster, and quite a bunch of bees may be formed before the queen alights amongst them; this also may be classed as a safety-first plan.

In hiving the swarm an experienced bee-farmer will not waste time searching for the queen amongst the cluster, but he will place a prepared hive near the swarm and shake some of the bees inside to act as "callers" for others of the main cluster when they are dumped near the hive entrance. As a matter of curiosity he may then keep a look-out for the queen, as she would certainly follow the bees into the hive. The beekeeper knows that the swarm would not have held its cluster unless the queen was present—and, after all, she may be inspected at any time after the bees settle down in their new home.

The Workers Regulate Brood Rearing.

The name "queen" may be responsible for the wrong impression that this bee is the ruler of the hive, whereas actually, of course, she is the mother of the colony. Even her egg-laying work, so essential to the life of the colony, is influenced by the requirements of her worker progeny.

The workers in their turn are influenced by conditions in the fields and the seasonal aspects of their work in their regulation of the quantity of brood raised. As the queen may be called upon at times to lay upward of 3,000 eggs—probably twice the weight of her own body—in twenty-four hours, the workers attend to her special diet, which consists of a predigested chyle food given in sufficient quantity at short intervals to enable her vitality to be maintained. The workers attend to the preparation of the brood-cells in which the queen is to lay. In order that no time may be lost in the all-important egg-laying service, the workers arrange the brood cells in a compact sphere so that the queen may proceed with her work in a methodical way. This would not be possible during extension work, if patches of cells were prepared indiscriminately about the brood combs.

It is interesting to observe that when a queen is failing or becoming too old to carry out the necessary arduous duties connected with her service, the queen will lay an egg in a cell which has been specially prepared by the workers for raising a young queen needed in the interests of colony welfare, to supersede the old one. Experience has proved that there is no tendency on the part of the queen to destroy such cells, as would be the case under other conditions which would lead to the raising of a rival.

Two Queens in a Hive.

In the case of necessary supersedure, it is usual for the colony to provide only one or two royal cells, as the presence of the old queen eliminates the risk of possible failure which would exist should the death of the queen occur from any accidental conditions, or when she has left with a swarm. We find, too, that nature has made wonderful provision in the case where an old queen of the colony has been superseded, the bees allowing the old queen mother, shall we call her, to remain in the hive along with her young laying daughter. In the writer's experience, this is the only occasion, under normal circumstances, that two queen bees will work side by side in a single brood-nest.

Protection for the Queen.

The queen which is not acceptable to the colony for any reason is destroyed by many bees packing tightly around her so that she succumbs to pressure and interference with her respiratory system. This method requires that the urge to destroy the queen must be fairly general throughout the colony and is a provision of nature against a single or a few bees killing a satisfactory queen by stinging.

Balling may occur where a queen inadvertently enters a strange hive, or when an introduced queen is not accepted as a result of, say, a young bee-farmer being so inquisitive concerning the result of an introduction that he opens up the hive before the specified time. There are odd occasions, too, during unusual conditions, when colonies may be somewhat discontented, that a colony may have a tendency to ball the queen when disturbed.

U.S. Servicemen Interested in Hawkesbury Agricultural College.

On the left is Oscar Blumer, recently associated with the well-known Victor Apiaries in North Dakota, and on the right is H. O. Corlis, of Texas.

Where the bee-farmer is present and finds the bees balling a queen, he may rescue her by dropping the ball of bees in water, or by judicious use of the smoker to separate the cluster.

Drones Care for Themselves.

The care accorded to the queen does not appear to be extended to the drones, or male bees, which are treated more or less as uninteresting guests. Most of the drones are liable at any time to be "put out of house and home" should any indication appear of an adverse condition affecting supplies from the fields.

To Shake Bees from a Frame.
A quick downward thrust of the hands causes the base of the thumbs to strike the top bar and dislodge the bees upwards.

Ordinarily bees may raise goodly numbers of drones during the late spring when progressive conditions usually obtain, and remain unconcerned regarding their presence in the hive. This is the time, however, when increase on the colony is most likely to occur, and provision must be made for the service of the drones in mating young queen bees raised to replace the ones leaving with the swarms. Bees leave little to chance, and they may raise a dozen or more queen-cells when only one queen is required as a replacement; in the same way they are disposed to raise an over-supply of drones for the queen-mating requirements. Should the contact with the drone be successful, the queen is mated but once, the meeting occurring during flight in the fields when the queen is about five days old.

Fortunately the bee-farmer is able to regulate the number of drones being raised, and thus reduce the tendency for over-production of drones. This is accomplished by using full sheets of comb-foundation in the hive-frames, so that a maximum of worker brood-comb will be constructed by the bees.

Shaking Bees from Combs.

A New Method.

MANY bees-farmers have the impression that a downward jolt of the frame should be employed to dislodge bees when shaking them from a comb. A better plan, however, and one that is becoming increasingly popular amongst our leading men, is to effect an upwards jolt which catches the bees off their guard, and is thus more effective. I believe this method was first demonstrated by Mr. H. Edison, late of Emmaville, New South Wales. It may be described as follows:—Curl the forefingers under the lugs at the end of the frame, the hands being about half closed, leaving a space of an inch or more between the top bar of the frame and base of the thumb (see illustration). Then give a sharp jab downward with the hands so that the top of the frame strikes flat against, and well across the base of the thumb, not between the thumb and first finger. The contact on the frame extends well over the position of the side-bar joints.

Some practice is necessary to become efficient in this shaking method, but it will be found well worthwhile to persevere with it.

Don't Let Secrets or Rumours Get Any Further Than You!

FEEDS and FEEDING NOTES.

POTATOES FOR CATTLE.

MANY farmers frequently find themselves with supplies of cull potatoes, and these are often used for the feeding of pigs. However, they can be valuable feed for cattle. An interesting example, showing the value of this feed for cattle and the reliability of feeding standards, occurred recently.

A herd of Jerseys were being fed on lucerne hay, but only maintained production of about 1 gallon of milk per head. Cull potatoes were fed to each cow at the rate of 5 lb. per head per day, and in a little over a week the average daily milk production rose by 2.7 lb., per head, or a little over a quarter of a gallon. The feeder, who had kept a careful record of the cows' production, inquired as to the reason for this response to the potatoes.

The reason may easily be seen from the following figures:—

100 lb. of potatoes contain 18 starch units;

∴ 5 lb. of potatoes contain 0·9 starch units;

3·25 starch units are required for the production of 1 gallon of Jersey milk;

∴ 0·9 starch units will allow the production of $\frac{10}{3\cdot25} \times 0\cdot9$;

that is, about 2·8 lb. of Jersey milk.

Note that the actual measured increase was approximately 2.7 lb., there being only about 4 per cent. difference between the calculated and observed response to the potatoes.

Obviously in this case, the lucerne was supplying only sufficient starch units for maintenance and production of about 1 gallon of milk, but more than sufficient protein units for this purpose. The potatoes partially remedied the starch unit deficiency, and allowed an increase in production. The owner was advised and increased both the lucerne hay and potatoes to bring production to a profitable level.

Suitable rations, using potatoes, which are a starch-rich but protein-poor feed, can be made up by using some protein-rich roughage or concentrate, the following being examples of rations suitable for thousand-pound cows producing about 3 gallons of milk of 3.8 per cent. fat content:—

20 lb. lucerne chaff; 30 lb. potatoes.

15 lb. first quality lucerne chaff; 20 lb. potatoes; 6 lb. ground barley.

50 lb. maize silage; 30 lb. potatoes; 3 lb. meat meal.

If the potatoes are any size, it is advisable to cut them before feeding. There is no necessity to boil the potatoes before feeding to cattle, although it is advisable when feeding them to pigs.

Pig-feeding Problems.

Value of Calcium Supplements for Pigs.

A STRIKING example of the necessity of calcium supplements for pigs on apparently first-class rations, but which are deficient in calcium, occurred recently.

A piggery was experiencing considerable trouble with poor growth rates, unthriftiness, and partial paralysis of the hindquarters, evidenced by staggering gait. The pigs were being fed on wheat, pollard, boiled meat offal and green feed; that is, on a ration practically complete except that it was low in calcium. On the Stock Inspector's advice, a calcium supplement (1 per cent. of ground limestone in the feed is most suitable) was fed, and in two weeks, no paralysis or stiffness was noticeable in any of the pigs, and growth rates had improved to such an extent that the owner declared that he intended to supply calcium supplements to his pigs in the future.

If ground limestone is not available, slaked lime may be used.

Silage for Pigs.

A correspondent recently inquired as to the value of silage for pigs. Apparently samples of silage differ greatly in their palatability for pigs, some samples not being

touched and others vomited after being eaten. Silage for pigs is not recommended unless no source of green feed is available and the silage is of good colour, that is, containing a good proportion of Vitamin A, and is palatable. Under these circumstances, some silage may be fed as a vitamin supplement, but owing to the high content of fibre in silage, it is not recommended to be extensively fed to pigs.

Current Feeding Costs.

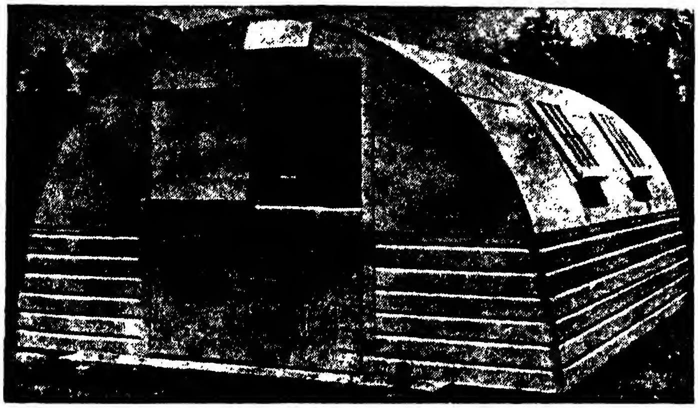
Feed.	Starch Unit Value per 100 lb.	Protein Unit Value per 100 lb.	Cost.	Cost per Starch Unit.	Cost per Protein Unit.	Remarks.
			ROUGHAGES.			
Lucerne hay or chaff ...	35-45 (Av. quality 40).	10	£8-£9 long ton ...	2·1d. 2·4d.	...	Roughage over twice as expensive as concentrates. Use a minimum of roughage and increase concentrate allowance for horses and cattle.
Oaten chaff ...	40	3	£8 10s. long ton ...	2·2d.	...	
Wheaten chaff ...	40	3				
Oaten hay ...	33	3	£8 long ton ...	2·6d.	...	
Wheaten hay ...	33	3				
			STARCHY CONCENTRATES.			
Wheat ...	72	8	3s. 3⅜d. per bushel in truck lots—3d. extra if bagged; small lots, 3s. 9d. bagged.	0·9d. 1d.	...	The cheapest grain available.
Wheatmeal ...	72	8	£7 5s. per short ton ...	1·2d.	...	....
Maize ...	78	8	6s. 9d. bushel ...	1·8d.	...	Most expensive of the grains.
Maize meal ...	78	8	£13 10s. per short ton...	2·1d.	...	....
Barley ...	71	7	3s. bushel ...	1d.	...	Practically as cheap as wheat.
Barley meal ...	71	7	£7 5s. short ton ...	1·2d.	...	....
Oats ...	62	8	3s. bushel ...	1·5d.	...	More expensive than wheat or barley.
Crushed oats ...	62	8	3s. 6d.-4s. per 40 lb. ...	1·7d.-2d.	...	....
Pollard ...	66	10	£6 short ton ...	1·1d.	...	Pollard good buying.
Bran ...	56	10	£6 short ton ...	1·3d.	...	Worth buying as a leavening agent.
Molasses ...	50	1	....	...	...	Very scarce—almost unobtainable.
			PROTEIN CONCENTRATES.			
Linseed meal ...	72	25	£9 10s.-£10 10s. per short ton.	1·6d.-1·7d.	4·5d.-5d.	Fair supplies.
Peanut meal ...	78	43	£6 10s. short ton, ex store.	1·1d.	1·8d.	Supplies very short.
Cocoanut meal ...	76	15	£7 per short ton, F.O.R.	1·1d.	5·1d.	Supplies available.
Meat meal ...	80	55	£10 10s. short ton F.O.R.	1·6d.	2·3d.	Moderate supplies available.

MINERAL SUPPLEMENTS.

Mineral.	*Cost.*	*Supplies.*
Ground calcium carbonate (ground limestone)—a calcium supplement.	34s. per short ton in bags, truck lots.	Supplies should be available in about four months.
Bone meal (a calcium and phosphorus supplement)...	£14 10s. per short ton...	Moderate supplies.
Bone flour (a calcium and phosphorus supplement)...	£11 15s. per short ton (less 15 per cent.).	Supplies available.

THE Division of Animal Industry of the Department of Agriculture draws the attention of persons manufacturing and selling proprietary medicines for livestock to the conditions of the Stock Foods and Medicines Act, 1940. This Act provides for the registration of all medicines used for livestock except where they are specifically prescribed for a particular animal by a veterinary surgeon or are specifically compounded for a particular animal by a pharmaceutical chemist.

"Although the Act has been in force since November, 1940, instances are still found of unregistered proprietary medicines being advertised and sold," states Mr. Max Henry, Chief of the Division, who is also Chairman of the Stock Medicines Board. "It is considered that sufficient time has now elapsed to enable all concerned to appreciate the meaning of this legislation, and therefore the plea of ignorance cannot be held as a reason why legal proceedings should not be taken against persons selling unregistered proprietary and patent medicines for livestock. It may be mentioned that the term 'stock' in this connection includes poultry, dogs and cats, as well as the larger domestic animals."



On the farms of tomorrow

Among the many matters which come under the head of post-war agricultural reconstruction is the question of more modern farm buildings and outhouses. Here, for instance, is an example of Arched Roof Construction with Masonite Tempered Presdwood applied to a modern pig house.

Masonite—"the wonder board of 1,000 uses"—will play a vital part in rural post-war development.

MASONITE PRESDWOOD . . .

TEMPERED PRESDWOOD . . .

TEMPRTILE . . . QUARTRBOARD DE LUXE

Manufactured by MASONITE CORPORATION (Aust.) LTD. from wood fibre.

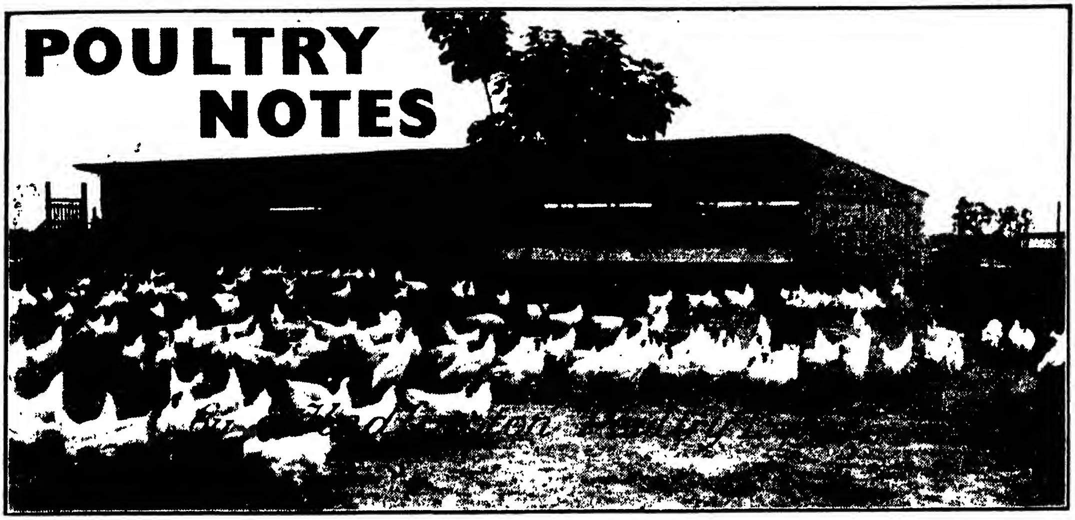
Distributors - - - - - - - - - - THE COLONIAL SUGAR REFINING CO. LTD. (Building Materials Division)

SYDNEY . . . MELBOURNE . . . BRISBANE . . . ADELAIDE . . . PERTH

Invest Your Savings in War Bonds for Post-war Use

MA47-43

POULTRY NOTES



Increasing Production.

THE recent announcement by the Federal Minister for Commerce and Agriculture that an increase of about 20 per cent. in the volume of egg production for the Commonwealth is desired, will be welcomed by poultry farmers, but of course no increase can now be effected until next year. In fact, it is apparent that there will be a reduction of at least 10 per cent. in egg production this year. However, judging by the heavy bookings for day-old chickens, it is obvious that most poultry farmers have been encouraged by the shortage of eggs, and better prices, to raise more chickens this season than last.

While there does not appear to be any likelihood of more pullets being raised than are required to attain the production goal set, it would be unwise for farmers to undertake the rearing of more birds than their equipment will properly accommodate.

Newcomers into the industry are prone to over-estimate the capacity of their rearing equipment, and thus suffer heavy losses in rearing, which result in lower production than would be the case if smaller numbers of chickens were obtained. One factor which is not taken into consideration by beginners when purchasing brooders, is that their capacity is based on day-old chickens, and allowance has to be made for reducing the numbers as the chickens grow.

In other instances attempts are made to raise chickens without suitable brooding arrangements, and this leads to a high mortality rate, while the surviving birds are mostly affected and consequently not so profitable as well reared chickens.

Table Poultry Prospects.

Those who have facilities for raising cockerels should exploit this branch of poultry farming to the fullest extent this season, as the outlook is for a firm market for early birds, and a heavy demand for Christmas poultry.

Cockerels being raised now should realise high prices at 14 to 16 weeks of age, and the cost of feeding them to the latter period should not exceed 2s. per pair, even if they are fed on a large proportion of wheatmeal in cases where pollard is not available.

However, cockerels hatched up to the middle of this month, if well reared, should show a better profit at Christmas, and if conditions permit, there should be no hesitation in holding them for the demand at that time. The cost of feeding in this case could be calculated at not more than 4s. 3d. per pair to 24 weeks of age, allowing for substitutes for pollard and bran being used.

How to Obtain Materials for the Erection of Poultry Buildings and Runs.

MANY inquiries are received by the Department concerning the purchase of various building materials by poultry farmers, and in order to save delay, information is given hereunder concerning the procedure to be adopted to secure different types of materials.

Wire Netting and Fencing Wire.

Only two sizes of wire netting are being made available for poultry farming. These are 72 in. x 2 in. x 17 g., and 36 in. x 1 in. x 17 g. Plain fencing wire of 10 to 12 gauge and barbed wire of 12½ g. can also be supplied. All these materials are ungalvanised; no galvanised wire or wire-netting is being manufactured.

To obtain netting and fencing wire application should be made to the Under-Secretary and Director, Department of Agriculture, stating the quantity of each class of wire or wire-netting required, the purpose for which it is to be used, the name of the firm from which supplies are to be obtained, and particulars of the number of birds kept.

Upon receipt of this information the Department makes a recommendation to the Materials Supply Department, and, where this is favourable, an authority is issued by that Department for the supply of the material through the firm nominated.

Water Piping.

Only black piping is available for ordinary water services, but galvanised material in limited quantities can be made available for hot water services.

For water piping, application should be made direct to the Deputy Controller, Materials Supply Department, Shell House, Carrington-street, Sydney. In making application, which can be by letter, the quantity and size of the piping required, the name of the supplying firm, and particulars of the purpose for which the piping is required should be given.

Corrugated or Flat Iron.

For these materials application should be made by letter to the Deputy Controller, Materials Supply Department, stating the quantity and sizes of the iron required, the purpose for which it is to be used, and the name of the supplier.

Only terne-coated and black iron is available for buildings where city water supply is available, but where no permanent supply is connected and the water from the roofs has to be conserved for drinking purposes, galvanised iron can be supplied. In this case, however, it is necessary to make a statutory declaration before the material is made available.

Timber.

There is no restriction on the sale of timber for the erection of poultry buildings, etc., in quantities up to 2,500 superficial feet, and timber merchants can supply up to this quantity if they have stock available. For quantities over 2,500 super feet, it is necessary for the timber merchant to obtain the approval of the Deputy Controller, Timber Control, Kembla Building, Margaret-street, Sydney.

There seems to be some misunderstanding regarding the control of timber supplies, and some producers have been unable to obtain their requirements from their usual suppliers, but it should be understood that if the timber merchant has supplies, he can sell up to the quantity stated above, without reference to Timber Control.

Fibro-cement Sheeting.

The position in respect of fibro cement sheeting, plain and corrugated, is that the manufacturers are not in a position to supply any of this material until defence orders have been fulfilled, and as the requirements for defence purposes are heavy, it might be some time before supplies are available for civilian requirements.

Erection of Buildings.

Anyone desiring to erect poultry buildings or fences, or effect repairs involving an expenditure of over £25 for materials and labour, must obtain the approval of the Deputy Director, Department of War Organisation of Industry, 18 Martin-place, Sydney. Application can be made either by letter or by obtaining a form from that Department.

Where application is made by letter, the following particulars should be supplied:—

1. The reason for wanting to build.
2. Location of property.
3. Materials proposed to be used, whether brick, fibro-cement, timber, etc.

4. List of materials already on the site and value.

5. Whether new building is to be erected or renovations or alterations.

6. Estimated cost.

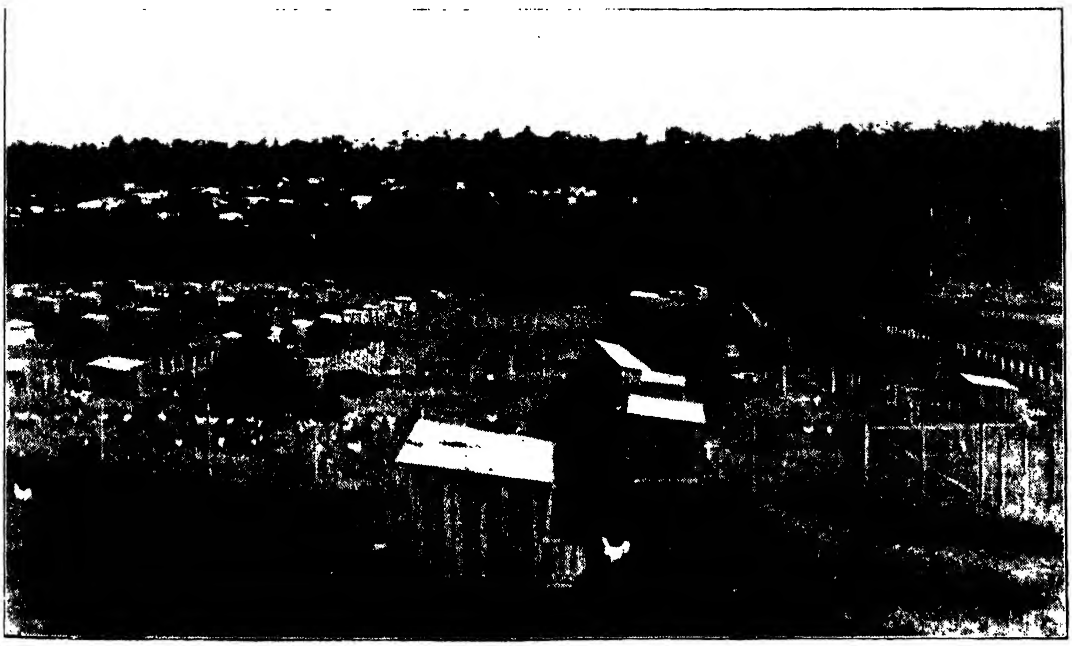
The Deputy Director, War Organisation of Industry, has pointed out that, owing to the need of conserving men, money and materials, the Minister is charged with the responsibility of reducing the volume of building, and sound reasons must, therefore, be advanced to show that the erection of the proposed new building, additions or alterations, cannot be deferred until after the war. However, in the case of poultry farmers desiring to extend operations, there is little difficulty in obtaining the necessary approval.

Experiment Work at the Poultry Experiment Farm, Seven Hills.

IN accordance with the decision to carry out more experiment work at the Poultry Experiment Farm, Seven Hills, three feeding experiments were commenced on 1st May, this year.

One experiment is designed to determine whether a high percentage of meatmeal fed in the morning mash has any effect upon the keeping quality of eggs when cold stored for eight to nine weeks. This test is being carried out at the request of the Egg Marketing Board, and involves testing and storing all the eggs of export quality produced by three pens of ten birds fed on 12 per cent. meatmeal, as well as the eggs from the same number of birds given the ordinary ration containing 6½ per cent. meatmeal. The only difference between the two rations fed is the percentage of meatmeal.

In conjunction with this test three other pens of birds are being fed the ordinary ration up to 1st December, when the meatmeal will be increased to 10 per cent. to ascertain whether the increase in the percentage of meatmeal will improve production in the late summer and autumn. There were indications in the results of a series of experiments carried out at Hawkesbury Agricultural College some years ago, that 10 per cent. meatmeal had a beneficial effect on production, particularly during the autumn, and this new experiment is to obtain definite information on that point.



Portion of the Poultry Experiment Farm, Seven Hills.

Another experiment of considerable interest to poultry farmers is one in which wheatmeal and green feed are being fed together with meatmeal for the morning mash.

The object of this experiment is to see whether such a mash could be substituted for the usual pollard and bran plus meatmeal mash, during times when there is an acute shortage of mill offals, without any detrimental effect on egg production or the health of the birds.

In this test two equal lots of 100 White Leghorn pullets are being used. One lot is fed on the ordinary ration as a control group, and the other a morning mash composed of two-thirds of wheatmeal and one-third of chaffed green feed, together with 8 per cent. of meatmeal. The proportions of wheatmeal and green feed are by measure (not weight) owing to the variation in the weight of green feed.

The afternoon grain feed is the same for both groups.

In each of these three experiments the ordinary ration which is fed to the control groups is made up as follows:—

Morning Wet Mash.

Pollard	60 lb.
Bran	33½ lb.
Meatmeal (55 per cent. protein content) ..	6½ lb.
	100 lb.

22 ounces of salt is dissolved in the mixing liquid.

Midday.

1 to 1½ ounces of green feed per bird.

Afternoon Feed.

Wheat	67 lb.
Maize	33 lb.
	100 lb.

Egg Production Costs.

IN response to a number of requests, a further estimate of the cost of producing eggs on a farm carrying 1,000 layers is given hereunder. The figures cover the period 1st June, 1942, to 31st May, 1943, and take into account the 3d. pool contribution during May, 1943.

Allowance is also made for the use of about 50 per cent. of wheatmeal in the mash, owing to the shortage of mill offals, and this increases the cost of feeding. Another item included is an amount of £25 for repairs, etc., which should about cover ordinary maintenance of buildings and runs.

The present basic wage rate of £4 17s. per week is set down as the labour cost, and while it is recognised that this amount does not adequately recompense the farmer for the long hours worked, it is a minimum standard, and no farmer should be expected to work for less.

As in the previous estimate published last year, no amount is shown for cost of chickens for replacements, as it is considered that under present conditions the sale of hens should cover the purchase of chickens and also allow for normal losses among adult birds: cost of feed and fuel for rearing the chickens is shown, as in numerous cases no revenue is derived from sale of cockerels, owing to the practice of buying pullet chicks.

Following are the details of costs:—

		£	s.	d
Interest on land (5 acres at £60 per acre) at 5 per cent.	=	15	0	0
Interest on buildings and plant (£800) at 5 per cent.	=	40	0	0
Depreciation on buildings and plant (£800) at 3 per cent.	=	24	0	0
Maintenance costs	=	25	0	0
Cost of feeding 1,000 layers at 8s. 6d.	=	425	0	0
Feed and fuel to raise 600 pullets to productive age at 2s. 3d. ...	=	67	10	0
Municipal and shire rates and water rates, and excess water ...	=	25	0	0
Incidental expenses, vaccination, etc.	=	15	0	0
Basic wage allowance (£4 17s. per week)	=	252	0	0
Marketing costs (freight or cartage, pool deductions, commission, etc.)	=	175	0	0
Cost of producing 12,000 doz. eggs		£1,063	10	0
Cost per doz. = 1s. 9¼d.				

The cost per dozen works out at 1s. 9¼d., while the gross return to the producer, based upon 12 dozen eggs per bird per annum, and the prices realised over the twelve months, 1st June, 1942, to 31st May, 1943, works out at 1s. 8½d. per dozen. This shows a loss of ¾d. per dozen, or £37 10s. for the year on the production from 1,000 layers.

Brucellosis-free Herd Scheme (Swine).

LIST OF ACCREDITED HERDS.

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Adams, J. P., " Melton," Daysdale.
Bathurst Experiment Farm, Bathurst.
Boardman, C., Camden.
Campbell, D., Hillangrove, " Wamberal," via Gosford.
Chapman, G. E. and Son, " Illabo Park," Alectown.
Cocks, F. D., " Condalarra," Gooloogong.
Cowra Experiment Farm, Cowra.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., " Glengar," Capertee.
Farrer Memorial Agricultural High School, Nemingha.
Fisher J. R. Furlong's Stud Farm, Richmond-road, Blacktown.
Foley, Mrs. E., Bligh Stud Piggery, Water Lane, Rouse Hill.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Holland, A. L., Argonne, Tubbul.
Hurlstone Agricultural High School, Glenfield.
Maybin, N. C., Towac, Orange.
McCaughey Memorial Agricultural High School, Yanco.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Riverina Welfare Farm, Yanco .
Rydalmere Mental Hospital.
Government Agricultural Training Farm, Scheyville.
Shirley, G. F., " Camelot," Penrith.
Smith, J. M., Eulo Glen, Urana.
Stewart, Sir Frederick, " St. Cloud," Dundas.
Wagga Experiment Farm, Wagga.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., " Gwandalan," Grenfell.
Wilson, A. G., Blytheswood, Exeter.
Wollongbar Experiment Farm, Wollongbar.

Herds Other than Registered Stud Herds.

Bathurst Gaol, Bathurst.
Berry Training Farm, Berry.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Croft, H. M., " Salisbury Court," Uralla.
Glen Innes Prison Camp, Glen Innes.
Gosford Farm Home for Boys, Gosford.
Goulburn Reformatory, Goulburn.
Kenmore Mental Hospital, Kenmore, via Goulburn.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital, Orange.
Parramatta Gaol, Parramatta.
Peat and Milson Islands Mental Hospital, Hawkesbury River.
Pollak, V., Marata, Harrow Road, Glenfield.
Smith, C. W. J., " Norbiton," Canadian Lead.
Stockton Mental Hospital, Stockton.
Yanco Agricultural High School

Abortion-free Herds.

THE following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion-free :—

Owner and Address.	Number in herd.
Bathurst Experiment Farm (Ayrshires)	24
Bauerle, P. A., Holbrook	12
Bush, W., Ben Lomond	18
Callan Park Mental Hospital (Aberdeen-Angus) ...	41
Carrick G., " Clonlea," Central Tilba	37
Cowley, L., Redbourneberry, Singleton	56
Cowra Experiment Farm (Ayrshires)	71
Department of Education—Farm Home for Boys, Gosford	36
Department of Education—Farm Home for Boys, Mittagong	36
Dixson, R. C., " Elwatan," Castle Hill	24
Fairbridge Farm School, Molong	93
Farrer Memorial Agricultural High School, Nemingha ...	35
Forster and Sons, Abington, Armidale (Jerseys) ...	265
Forster, N. L., Abington, Armidale (Aberdeen-Angus)...	188
Gladesville Mental Hospital	34
Grafton Experiment Farm (Aberdeen-Angus)	29
Grafton Experiment Farm (Australian Illawarra Shorthorns)	93
Hann, O., Chatsworth Road, St. Marys	35
Hawkesbury Agricultural College, Richmond (Jerseys)...	108
Hicks, A. A., Estate, Culcairn	52
Hill, E. Pritchard, Bowling Alley Pt. (Jerseys) ...	96
Hordern, E. D., Cabramatta (A.I.S.)	95
Hurlstone Agricultural High School, Glenfield	39
Killen, E. L., " Pine Park," Mumbil	223
Leitch, J. F., " Tunbridge," Merriwa (Aberdeen-Angus)	72
McEachern, H., Tarcutta (Red Poll)	52
Martin Bros., " Narooma," Urana-road, Wagga ...	125
Navua Ltd., Grose Wold, via Richmond (Jerseys) ...	122
New England Experiment Farm, Glen Innes (Jerseys)...	97
New England University College, Armidale	5
Peel River Land and Mineral Co., Tamworth	82
Reid, G. T., " Narrangullen," Yass	171
Robertson, D. H., Scone	82
Rydalmere Mental Hospital, Rydalmere	57
Salway, A. E., Cobargo	95
Skinner, D. S., " Wyworrie," Ben Lomond	38
Smith, Jas. C., Ben Lomond	83
Stewart, Sir Frederick, " St. Cloud Stud," Spurway-street, Dundas	9
Trangie Experiment Farm, Trangie	121
Wagga Experiment Farm, Wagga, N.S.W.	45
Walker, Jas. R., " Strathdoon," Wolseley Park ...	32
White, F. J., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	189
Williams, Chas., Ben Lomond	27
Wilson, A. G., " Blytheswood," Exeter	62
Young, A. H., " Rock Lynn," Cudal (Polled Beef Shorthorns)	12

MAX HENRY, Chief of Division of Animal Industry.

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
		1943.
Wollongbar Experiment Farm...	112	4 July.
A. E. Liggins, " St. Leger Dairy," Kuring-gai Chase Road, Turramurra North	52	7 ,,
Kahlua Pastoral Co., " Kahlua," Coolac ...	314	10 ,,
S. E. E. Cohen, Auburn Vale Road, Inverell...	23	12 ,,
B. N. Coote, Auburn Vale Road, Inverell ...	53	14 ,,
A. N. De Fraine, Reservoir Hill, Inverell ...	22	15 ,,
Cowra Experiment Farm	41	27 ,,
P.M. Burtenshaw, Killean, Inverell	31	27 ,,
Sir F H. Stewart, Dundas	6	30 ,,
Lunacy Department, Rydalmere Mental Hospital	65	30 ,,
Berry Training Farm, Berry	162	31 ,,
W. J. Frizelle, Rosenstein Dairy, Inverell ...	76	1 Aug.
W. Budden, " Hunter View," Kayuga Road, Muswellbrook	18	7 ,,
T. McLane, Wellingrove, Inverell	33	10 ,,
W. Willis, " Rosedale," Inverell	17	13 ,,
E. L. Killen, " Pine Park," Mumbil	252	23 ,,
A. Hannaford, Braidwood	20	26 ,,
W. S. Grant, Braidwood	20	26 ,,
J. McKenzie, Inverell	35	28 ,,
Farrer Memorial Agricultural High School, Nemingha	39	29 ,,
The William Thompson Masonic School, Baulkham Hills	50	29 ,,
Navua Ltd., Grose Wold, via Richmond (Jerseys)	118	4 Sept.
Australian Missionary College, Cooranbong ...	113	8 ,,
Department of Education, Gosford Farm Home	40	29 ,,
A. L. Logue, " Thornbro," Muswellbrook ...	46	13 Oct
W. C. Wyatt, Sherwood Road, Merrylands ...	32	16 ,,
Woomargama Estate	207	22 ,,
W. J. Stephenson, " Hill View," Fig Tree ...	57	1 Nov.
Barnardo Farm School, Mowbray Park ...	75	4 ,,
State Penitentiary, Long Bay	10	9 Dec.
		1944.
Limond Bros., Morisset	60	13 Jan.
J. M. Turnbull, " Pastime," Kayuga Road, Muswellbrook	75	15 ,,
E. R. Fishlock, Fig Tree, Wollongong ...	38	18 ,,
St. Ignatius College, Riverview	25	27 ,,
Department of Education, Yanco Agricultural High School	69	6 Feb.
Riverina Welfare Farm, Yanco	74	6 ,,
St. John's College, Armidale	30	8 ,,
A. C. O'Dea, Perry Street, Dundas	28	14 ,,
McGarvie Smith Animal Health Farm, Liverpool	55	22 ,,
C. Wilton, Bligh Street, Muswellbrook ...	75	3 Mar.
N. L. Forster, Abington, Armidale (Aberdeen Angus)	188	12 Mar.
Forster and Sons, Abington, Armidale (Jerseys)	87	13 ,,
Lunacy Department, Morisset Mental Hospital	84	15 ,,
Wagga Experiment Farm (Jerseys)	81	20 ,,
Trangie Experiment Farm, Trangie	121	20 ,,
New England University College, Armidale ...	12	31 ,,
St. Michael's Orphanage, Baulkham Hills ...	18	31 ,,
W. H. Long, Brodie's Plains, Inverell ..	44	13 April.
A. G. Wilson, " Blytheswood," Exeter ...	62	14 ,,
H. F. Bradley, " Nardoo," Ashford Road, Inverell	35	15 ,,
Grafton Experiment Farm	191	15 ,,
Lunacy Department, Callan Park Mental Hospital	26	1 May.
T. J. Wilks, " Oaks Farm," Muswellbrook ...	37	5 June.
New England Experiment Farm, Glen Innes (Jerseys)	73	27 ,,
G. T. Reid, " Narrengullen," Yass	274	3 July.
Farm Home for Boys, Mittagong	49	9 ,,
St. Vincent's Boys' Home, Westmead ...	26	20 ,,
Lidcombe State Hospital and Home	106	30 ,,
Hurlstone Agricultural High School, Glenfield	37	31 ,,
Ehsman Bros., Inverell	28	13 Aug
Peel River Land and Mineral Co., Tamworth (Beef Shorthorns)	82	28 ,,
Fairbridge Farm School, Molong	92	31 ,,
Bathurst Experiment Farm	24	9 Oct.
Lunacy Department, Gladesville Mental Hospital	34	23 Nov.
Hawkesbury Agricultural College, Richmond (Jerseys)	110	18 Dec.
		1945.
The Sydney Church of England Grammar School, Moss Vale	51	5 Feb.
Koyong School, Moss Vale	2	8 ,,
New England Girls' Grammar School, Armidale	30	11 ,,
W. W. Martin, " Narooma," Urana Road, Wagga	143	22 ,,
R. C. Dixon, Elwatan, Castle Hill (Jerseys) ...	31	29 Mar.
Lunacy Department, Parramatta Mental Hospital	66	30 ,,
A. E. Stace, Taylor Street, Armidale	38	1 April.
A. D. Frater, King's Plain Road, Inverell ...	123	12 ,,
F. C. Harcombe, Hillcrest Farm, Warialda Road, Inverell	38	13 ,,
Parker Bros., Hampton Court Dairy, Inverell	102	17 ,,
H. F. White, Bald Blair, Guyra (Aberdeen Angus)	186	30 ,,
Emu Plains Prison Farm	108	7 May.

Tubercle-free Areas.

The following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis :—

Bombala Area.
Inverell Area.
Braidwood Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

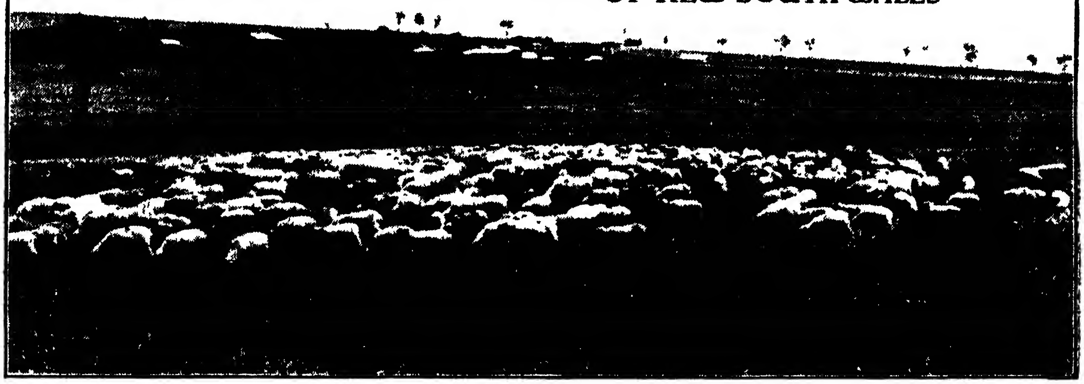
MAX HENRY, Chief of Division of Animal Industry.

Influence of the Bull on Dairy Production.

(*Continued from page 322.*)

It is the bull that makes or breaks the herd when young stock are being raised on the property for replacements. It takes time to find this out, but if the bull used is of known production strain the farmer is on the right track. If the animal is used correctly and every cow in the herd is recorded for production and properly fed, the way is paved to success.—J. W. G. SMITH, Senior Dairy Instructor.

The Agricultural Gazette of New South Wales



August, 1943.

EDITORIAL——

Keep in Step.

District and Local War Agricultural Committees did an excellent job last season in the face of drought, acute shortages of labour, transport and almost all materials and services necessary to aid production. With the appointment in the near future of several full-time district organisers, and the provision of additional assistance in other directions, the capacity of Committees to render even better service this coming season will be vastly increased.

As a further help to greater achievement we have the recent assurance of the Minister for Commerce and Agriculture that the Government will do all that is humanly possible to supply all the aids—services and materials—that will assist farmers to produce all the food the nation requires. However, to achieve the ultimate in food production something more is required; every primary producer, every official and all bodies and institutions concerned with any aspect of agriculture must align their efforts with those of the War Agricultural Committees. The War Agricultural Committee organisation is the machinery set up by the Federal Government to ensure the orderly and uniform channelling of all the services and assistance essential to achieve production targets. Those who choose to disregard the means provided for obtaining essential services and materials are not playing their part in the national food production plan, and have no cause for complaint if they fail to secure what they need to carry on. To be out of step with the War Agricultural Committees is to be out of step with the nation.

A disinclination on the part of producers to assess their requirements sufficiently far in advance to enable War Agricultural Committees and controlling authorities sufficient time to organise to meet the demands made upon them for labour, transport, and other essentials was at the root of past failures. Now that assurances have been given that the Government is all-out to meet essential demands, farmers should cultivate the habit of assessing, or of helping War Agricultural Committees to assess, their difficulties as far in advance as possible. This is necessary if farmers are to produce to the capacity of their farms and not merely to the capacity of the remaining facilities on those farms.

Too many people—and they are not all farmers—still regard War Agricultural Committees as just another rural organisation, and one which, because of its official

backing, perhaps constitutes a threat to established industry organisations. Nothing could be further from fact; there should be no clash, either of interests or activities. If all sectional or industry organisations wholeheartedly backed the War Agricultural Committee machine—some are already doing so—the nation would be better served.

Livestock and Soil Fertility.

ANIMAL industry is sometimes regarded as an entity of its own, and it is not always recognised how important a part livestock play in the conservation of soil fertility. In other countries where farming is more intensively carried out this is fully recognised. All our agricultural activities depend on soil fertility, and to ensure that this shall not be dissipated it is always necessary to bear in mind the old saying, "Stock and Crops—Crops and Stock." Judiciously blended animal and plant husbandry can safeguard our national asset—the land—but the more these activities are separated the less permanent and securely founded will be our rural economy.

Officers of the Division of Animal Industry of the Department welcome any indication of an improvement of feeding methods and the establishment of systems of fodder conservation. The adoption of sound measures on these lines not only results in quicker and surer returns from the livestock themselves, but helps greatly to maintain soil fertility.

Whilst it is desirable that stock should be well bred and well fed, the benefits derived therefrom may be seriously depleted if the health of the livestock is neglected. In fact, the losses are heavier when disease occurs, if more money has been expended in producing the livestock and their products. Indeed, it should be the case that livestock activities should not be undertaken unless it is evident that reasonable methods can be adopted to fight disease.—MAX HENRY, Chief, Divison of Animal Industry, in a recent broadcast.

Further Talks for Listening Groups.

THE Australian Broadcasting Commission is continuing the presentation of series of talks on social problems which will require thought and careful planning to make their solution worthwhile in our post-war Australia.

Listeners are invited to listen-in to, and especially, to discuss these talks with their friends and families, forming for the purpose small "listening groups" of from six to a dozen people.

Every Monday, therefore, a talk will be given by an authority in each subject at 8 p.m. E.S.T. on the alternative programme (2BL, 3LO, 4QR, 5CL and 7ZR); an hour and a half later, at 9.30 p.m. E.S.T. the same speaker will discuss his talk with two or three other lay men and women on the national programme (2FC, 3AR, 4QG, 5AN, 6WN, 7ZL, VLR, VLQ, and all Regional Stations except 2CR and 3WV).

Scripts and other literature will be sent to each listening group free of charge.

Commencing on 23rd August, talks on "international" problems will be given as follows:—

Aug. 23—"Population"	W. D. Borrie
Aug. 30—"Unemployment"	To be arranged
Sept. 6—"Standards of Living" ..	Colin Clark
Sept. 13—"Defence"	Chester Wilmot
Sept. 20—"Education"	Professor Eric Ashby

After these discussions have been held, listening group secretaries are invited to send the group's conclusions, criticisms and requests for further information to the Organiser of Listening Groups, Australian Broadcasting Commission, Box 487AA, G.P.O., Sydney. These are passed on to the speakers for their consideration and reply. Thus a valuable exchange of opinion and knowledge takes place.

Systematic Distribution of Ammunition.

A COMMONWEALTH-WIDE plan for the systematic distribution of ammunition for pest control came into operation on the 5th July. Under this scheme primary producers must apply to the local police for ammunition permits. If the application is for more than a specified minimum the application must be referred to the appropriate local or district War Agricultural Committee for recommendation.

When producers are issued with permits they should lodge them immediately with storekeepers, even though storekeepers have no ammunition on hand. Storekeepers return these individual permits to the police and obtain a bulk permit which enables them to obtain supplies from wholesale distributors. Similar procedure enables distributors to obtain supplies from manufacturers, and the manufacturers to obtain materials for the making of further ammunition.

The plan might be considered cumbersome, but only if we ignore the fact that ammunition is in such short supply, that, for the time being, at any rate, hand-to-mouth distribution has to be insisted upon.

Planned Agriculture.

The Theme of the Agricultural Bureau Conference.

FOR the three days of the Twentieth Annual State Conference of the Agricultural Bureau of New South Wales, held at Hawkesbury Agricultural College from 13th to 16th July, the delegates discussed "Planned Agriculture" in all its aspects—and went back to their branches much better informed as to the administration of Australian agriculture under present difficult war conditions, and with much food for thought as to the place an organised and planned rural industry could take in the days to come.

Australia on the Food Front.

The conference was opened by the Hon. W. F. Dunn, M.L.A., New South Wales Minister for Agriculture, who said that he was proud that the many thousands of members of the Agricultural Bureau, an organisation which was sponsored by his Department, were striving to fulfil the aims of the organisation in regard to agricultural education, agricultural co-operation and rural social improvement. Under war time conditions Bureau branches were co-operating wholeheartedly with District War Agricultural Committees in their task of organising supplies of rural labour to maintain the food front, and their work in connection with such matters as release of controlled materials and commodities, planned used of machinery, transport, fuel, etc.

Mr. Dunn indicated some of the ways in which Australian farmers were making outstanding contributions on the allied food front, despite many unavoidable limitations and difficulties. The labour available to Australian agriculture in 1942 was only approximately two-thirds that of pre-war days, and yet, Australia had remained one of the main food citadels, coming next only to U.S.A. and Canada in the production and supply of food for war. Some of the goals aimed at were: 500,000 tons of potatoes—a 60 per cent. increase; 39,000 tons of cheese, also 60 per cent. above average production; and 55,000 tons of rice—and it appeared as if 70,000 tons would be produced, representing an increase of nearly 70 per cent. above average. A goal of 100,000 tons of pig meats was aimed at for 1942-43, and canned meat, which was in great demand in the United Kingdom, had been increased in the third year of war to seven times the pre-war average. Canning and dehydration required three to four million sheep annually and this demand necessitated much planning by the Commonwealth Government.

The Hon. W. F. Dunn at the Conference.

With him are:

Left: Dr. R. J. Noble, Under-Secretary and Director.

Right: Mr. P. Coelli, Bureau General President and Mr. A. E. Southee, College Principal.

Mr. Dunn said that plans were afoot for mass production of vegetables on a scale never before visualised in Australia, and that the latest methods of mechanical cultivation and harvesting were being introduced. The Murrumbidgee Irrigation Area was rapidly becoming one of the greatest vegetable growing centres in Australia—one of the results of careful planning. This year 500 farmers on the M.I.A. delivered 12,000,000 lb. of fresh vegetables to Leeton cannery, and from this the cannery processed seven million cans of vegetables — chiefly for allied forces — whereas in pre-war days the production of vegetables on the Area was scarcely sufficient for domestic requirements and the output of canned vegetables was practically nil.

It was interesting to note, said Mr. Dunn, that under reciprocal lease-lend Australian supplies of food to the American forces here and in the South-West Pacific zone, were a dominate factor. In 1942 the American Army in Australia received 3,630,000 lb. of canned meat and 30,000,000 lb. of fresh meat. It was expected that in 1943 Australia and New Zealand would supply the Americans with five times the 1942 quantities of vegetables, meat and other food.

Such production, said Mr. Dunn, was of much significance in the national war-time economy, and could only be reached by planning on the part of the Commonwealth, the States, districts, localities and individual farmers.

Australian Production Must be Nationally Planned.

Mr. Bulcock's Address.

"PLANNING the food front must be approached from an angle that was likely to impose solvency on agriculture," said Mr. F. W. Bulcock, Federal Director-General of Agriculture in his address to the delegates. Rural communities, he said, had refused to learn the lessons that had been exposed to their gaze at all times and had accepted a subordinate rather than a co-equal position with other industries. "Why should this be so?" he asked. One of the reasons was that those engaged in rural industries had never planned for their own well-being.

The question that presented itself to-day was: "Does war offer the opportunity for the first time to establish a coherent organisation functioning throughout Australia—an organisation resolute and determined that agriculture will no longer be the hand maiden of the cities, but their equal?" On the other hand, it could be asked whether it was possible for producers to hold their inherent individual rights and coalesce them with the nation's rights.

The need for organisation and planning of rural production had been seen in other countries than Australia prior to the war. Major Eliott had achieved much in Great Britain, and the United States had developed the "new deal," which, with all its objections, still functioned. If England and U.S.A., individualistic in their outlook, had found it necessary to link the State with production, could we avoid similar action? Some time ago Mr. Bulcock had been interested in an economic survey of Australian agriculture, and he had found that the State which was planning and organising its agriculture had the best economic structure.

We could not at present see all the implementations of the Atlantic Charter—they might be favourable but they might be adverse—and we should plan to meet the situation whatever the outcome. Agriculture was the source of all wealth, and a nation whose agriculture decayed soon found itself on the decline; and so it was necessary to plan our agriculture on a national basis.

Where should planning and organisation start? Mr. Bulcock suggested that it should start with the individual, and run across the present structure; it should be brave enough to refuse to pay the present high tribute to the middleman. Organised marketing was the natural corollary of organised planning. It might be that the present D.W.A.C. organisation was the focal point.

One essential was improved rural education. Rural Norway and Denmark had built to greatness on winter schools. If the aim was rural efficiency, then there must be an efficient system of farm costing. At the present time in Australia no one gave the same figure for the same crop in the same district. It was necessary to get agriculture to the exact mathematical basis of other industries.

Then in planned national agriculture there must be co-operation between the States and the Commonwealth. Assuming that uniformity in taxation had come to stay, the States would have increasing demands while limits as to finance would be imposed by the Commonwealth. Under these circumstances it was necessary to have the Commonwealth as a "supervising co-operator." If we looked at problems such as tick control, damage by sheep blow-fly, and the potential danger of buffalo fly we could realise how much economic loss was preventable.

We had not only to plan for the necessities of war, said Mr. Bulcock. Wars had come and gone throughout history, but agriculture had to go on for ever. We heard much of the "new order," but could there be one without security, and could there be security unless rural life was secure? The origin of our food, clothing and shelter was rural production.

It was evident, therefore, that any planning for the nation's future must be associated with rural life. Producers must be brave enough to insist on planning their industry as an economic entity, and the planning must be organised, resolute, and have the co-operation of the individual, the State, and the Commonwealth.

The State Department's Place in Planned Agriculture.

"WAR is an evil thing, but at times it is a means of doing things we could not otherwise do," said Dr. R. J. Noble, Under Secretary and Director of Agriculture, when addressing the conference on the place of the State Department of Agriculture in organised planning of food production. It was of passing interest that the British Department of Agriculture was first established during the Napoleonic wars.

Since the outbreak of the present war some of the investigational work being carried out by New South Wales Department of Agriculture had been suspended and some of the staff allowed to go to the fighting forces during the time when it was felt that every man possible was needed in those forces. Some of these men were returning to the Department now that the food front had become so important.

The Administrative Buildings at Hawkesbury Agricultural College.

Not only was it necessary to plan this food front—and we now knew more clearly what were our national agricultural needs—but it was also necessary to make provision for putting the plan into action.

IN his presidential address to the conference, Mr. P. Coelli, of Caragabal, General President of the Agricultural Bureau, said "Many, if not most farmers, suspect in 'planned agriculture,' a drastic change in their way of life, with all its old implications of freedom. Planned agriculture cannot help but bring changes in the farmer's way of life; but those changes will not necessarily be for the worse. On the other hand they may be necessary for Australians to retain a way of life. I mean that, not only from the viewpoint of winning the war—and thereby retaining a say in what shall be our way of life—but also from the aspect of so improving our production efficiency as to compete successfully on oversea markets, new or old, when the world settles down after the immediate post-war years."

Agricultural production differed from secondary, in that there could be no sudden changes. It was the State Department's function to keep in touch with the Federal authorities which knew the national need, and to put the plan into operation at the appropriate time. Then in planning agriculture it was necessary to recognise the need for conserving soil fertility, both because of the war and in spite of it. It was the job of the State Department to protect the farmer and his asset the soil in such circumstances. There was no single, simple, agricultural problem, and there could be no blue print and cold specifications. The production of a pound of butter or of a side of beef was in itself complex, and each was but a phase in the production problem.

Necessary as were planning and co-operation in time of war, they would be of equal importance in the post-war world. Dr. Noble said that much planning had already been done in his Department for future investigational and educational work. One such project was founded on the fact that although agriculture was a science and an art, it was also a business. The Department planned, through its Division of Agricultural Economics, to enable the farmer to examine his own business.

There were already indications that international planning and co-operation would operate post-war to a degree not thought of pre-war, and the State Agriculture Department was preparing to undertake its responsibilities at that time.

The Purpose and Work of War Agricultural Committees.

THE theme "Planned Agriculture" had been selected for the Agricultural Bureau Conference, said Mr. C. C. Crane in his address, because it was realised that planning was essential in order to organise a food front so as to bring to a successful conclusion the fight to remove the strain and terrors of the days in which we lived. Mr. Crane is Chief of the Division of Information and Extension Services, Department of Agriculture, and is also State Executive Officer for the New South Wales War Agricultural Committees.

It was essential, he said, to provide the machinery to execute plans decided upon, and designing this organisation was as important as the food front plan itself. In such organisation each unit must be perfect, and to attain to this standard the personnel of the units must thoroughly understand their work.

The district and local War Agricultural Committees were definitely part of the machinery for implementing the plan for agriculture in Australia, and their members should appreciate the definite part they were called upon to play. What was this task? Briefly, it was to get the job done. Practical men had been called on for this particular purpose—to get over the difficulties. They could by-pass them if they had to, but to get over them in some way was their job.

It had been found necessary to decentralise the organisation right down to the individual farmer. Many Bureau members present belonged to District War Agricultural Committees, and all should be members of local committees. Mr. Crane said that if a committee was a good one it was not just a farmers' organisation, but was

a cross section of that rural community brought together for a national purpose of organising a food front—to develop the national policy and not any sectional policy and to see that the food front was as efficient as the fighting front.

The District War Agricultural Committee organisation would not displace farmers' organisations, which were already playing a great part for the food production scheme. The Agricultural Bureau, in particular, must go on to greater things in its work of enlightenment and leadership.

To implement this national plan, the committees required power and prestige. The Federal Government had deputed power to the State Government and to the District War Agricultural Committees, and it was the job of the latter to pass this power on to local committees. It was the district committee's job to organise and co-ordinate the area allotted to it, and to be concerned equally with the whole area. As a result it would have active local committees—and if it did not it was not a good district committee. In turn it was up to the local committee to do on its own responsibility everything the district committee required of it. Only when it got into difficulty and could not manage, should it call on the district committee. Similarly the district committee should handle its own area and not call on the State Executive unless in difficulty.

DURING the three days of the conference, delegates were given the opportunity of "discussing" each subject with the principal speaker.

The programme not only included sessions devoted to the general administration of Australian agriculture on Commonwealth, State and district levels, but also many given over to particular aspects, such as marketing, price control, manpower, machinery and materials supply, transport, and some cultural problems, while a special session was provided for women delegates.

Mr. Crane said he hoped that the committee personnel realised how democratic the scheme was, and that its purpose was to achieve without hesitation the quantity and quality of produce required.

Methods of Working.

The method of working the plan came naturally under two headings. The first was education, and that meant getting all the facts in relation to the projects. The second was co-operation. This meant, in the first place, such things as pooling machinery, manpower and transport, etc., insofar as their shortage made it necessary. Then it involved co-operation between farmer and non-farmer. Volunteer labour pools had played a tremendous part in some rural work and a tribute should be paid to such organisations as the W.A.S.P.S.

Finally, there was co-operation between the farmer and Government Departments. Committees were urged to use their national service officers, transport officers and police to help them with their problems. These officers had been supplied to these areas by the respective departments. The Department of Agriculture had made a magnificent gesture in allowing its field officers to act as chairmen of the District War Agricultural Committees.

In conclusion, Mr. Crane said that though the scheme appeared to have much in it that savoured of restriction and regimentation, these things had been accepted only as expedients to win the war—to be free of the "yellow peril" and in the long run to be free of regimentation and restriction.

Preventable Loss from Animal Disease.

PREVENTABLE loss from animal disease should be avoided whenever possible, but particularly at the present time when, somewhat to our astonishment, we find ourselves faced with definite shortages in some animal products. Amongst these animal products are what are often called the "protective foods," so necessary for the maintenance of the health of our human population. The health of our people is a vital factor at all times, but especially so at present when all energies are required in a war effort.—MAX HENRY, Chief, Division of Animal Industry, in a recent broadcast.

GROW POTATOES UNDER CONTRACT For Civilian and Defence Needs.

1943-44 Conditions.

NEW South Wales has been asked by the Australian Potato Committee to contribute 40,000 acres towards the Australian potato crop for civilian and defence needs in 1943-44—an increase of 14,000 acres on the area planted last year and 100 per cent. over the pre-war area. As an inducement, growers are being offered contracts at a fixed price of £14 a ton c.i.f., Sydney, for all New and No. 1 Grade potatoes of specified varieties, the grower to be responsible for the usual marketing costs but not for the payment of commission.

The Department of Agriculture aims to have 32,000 acres of potatoes grown on the tablelands and 8,000 acres in early districts. It is anticipated that there will be sufficient seed to meet all demands. Growers are able to purchase their seed direct from the usual distributors without a permit, and from growers with a permit. Permits to purchase seed may be obtained from the Australian Potato Committee, the Department of Commerce, Sydney, the Department of Agriculture, Sydney, or the local Agricultural Instructor or Inspector. All growers, especially those in the tableland districts, are urged to obtain their seed supply as soon as possible and store it until planting time arrives.

Contracts for the early districts as well as tableland areas are now available from District Agricultural Instructors and Fruit Inspectors, as well as from the Department of Agriculture, while many of the leading merchants have already been supplied with contracts for distribution to growers.

The machinery for the handling and marketing of potatoes has been completely overhauled so as to avoid many of the difficulties which were experienced last year. This season's contract differs from last year's in that it provides for controlled deliveries to the market, and also contains a clause whereby the Australian Potato Committee may require growers to harvest their crops early, if the supply position necessitates such action, in which case the grower is compensated for loss in yield. In the event of a glut the grower will also be compensated for any potatoes not required to be harvested.

In order to obtain the required planting, it will be necessary for established growers to increase their areas, and many new growers to enter the field. The Department strongly advises that as much new land as possible be used for potato growing.

The Terms and Conditions.

To enable growers to understand clearly the terms and conditions of the 1943-44 season's potato contract, the Department of Agriculture has prepared the following summary of the provisions, with explanatory notes.

The Crop and Varieties.

The contract for early crops covers planting for harvesting during period 1st October, 1943, to 30th April, 1944, while the tableland contract relates to potatoes harvested during the period 1st February, 1944, to 30th November, 1944.

The following varieties may be planted under this contract:—Factor (Up-to-Date), Katahdin, Satisfaction (Brownell), Carman, Manhattan, Delaware. There is nothing to prevent growers from planting other varieties outside contract if desired.

Signing the Contract.

Intending contract growers are requested to note the following points when completing the agreement:—

1. The contracts are to be *completed in duplicate*—one copy being the Department's copy, and the other the grower's.
2. Both copies are to be *signed* by the grower and his signature *witnessed*. To be *valid*, both copies of the contract must also be *signed by an authorised officer* of this Department acting as Delegate to the Australian Potato Committee.
3. The grower should make certain that the Department's copy of his contract is forwarded to the Department of Agriculture for registration and filing. This is necessary so as to enable the Department to advise the grower of his contract number prior to the marketing of the potatoes.
4. The contract is only to be completed in respect of areas of half an acre and over in early producing districts, and 1 acre and over in tableland districts.
5. Contracts are available from Agricultural Instructors, Fruit Inspectors and merchants, as well as the Department of Agriculture, Box 36A, G.P.O., Sydney. The District Agricultural Instructors and Fruit Inspectors, as well as officers of the Head Office staff, are authorised to sign potato contracts on behalf of the Australian Potato Committee.

Cultivation.

The grower is required to do everything possible to ensure a maximum crop of No. 1 and New Grade potatoes.

Inspection.

The grower is required to allow authorised persons to inspect the land, crop and potatoes at any stage from planting to including delivery, and to take samples.

Harvesting.

The grower is required to notify the Australian Potato Committee in writing of the acreage which will be ready for harvesting. This notice

must be sent not less than fourteen days before the crop will be ready. Unless within this period the grower receives instructions to the contrary, he is free to dig the potatoes after fourteen days from giving this notice.

Delivery.

The grower is required to bear the cost of harvesting and delivery, and he is to deliver the potatoes of No. 1 and New Potato Grades at the time and to the place required by the Australian Potato Committee, and in accordance with any marketing plan which is operating in the State. (*Note.*—Growers should watch newspapers for statements and instructions relating to delivery.)

If when the grower receives instructions to deliver his potatoes he considers that they have not reached the stage of maturity at which they are usually dug in his district, he may within seven days after being required to dig object to the digging by giving notice in writing to this effect to the Committee.

The Australian Potato Committee may then postpone or suspend the date of digging but, if it declines to do this, it may appoint arbitrators to decide whether or not the potatoes are mature. These arbitrators will be one representative of the Australian Potato Committee, one representative of the Department of Agriculture and one representative of potato growers.

If these arbitrators decide that the potatoes were mature at the date the instructions to dig were given, the grower will lose the benefit of the guarantee given by the Australian Potato Committee under the contract. If, however, the arbitrators uphold the grower's objection and the Australian Potato Committee still insists upon digging, the grower will be entitled to the guaranteed price, not only for the New and No. 1 Grade potatoes actually dug and marketed, but also for the estimated additional quantity of No. 1 and New Grade potatoes which would have been harvested had the crop been allowed to mature.

If the grower, without a good reason, fails to carry out any instructions given by the Australian Potato Committee regarding the digging and harvesting of his crop, he shall lose his right to the guarantee for any potatoes except those already delivered. This clause does not apply to grades of potatoes other than New or No. 1. (*Note.*—Genuine lack of sufficient labour may be regarded as a good reason.)

Branding of Bags.

The grower must legibly brand the sacks containing his potatoes with his name and address in accordance with the potato grading regulations, and also his contract number. (*Note.*—This is important—the spelling of the surname and the initials of the christian names should agree with those given in the contract.)

The registered number of the contract will be notified to the grower by the Department of Agriculture. On receipt of this advice the grower should immediately insert the number on his copy of the contract in the special space provided for that purpose. It is essential that the grower should record the number of his contract, because the contract provides that he must brand his bags with the contract number. The sacks must be clean, sound Chapman sacks which are to be supplied by the grower at his own cost.

Grades.

The potatoes must comply with No. 1 or New Potato Grades described in the grading regulations under the Plant Diseases Act in force at 1st July, 1943. This contract does not apply to potatoes other than those complying with No. 1 and New Potato Grades. (*Note.*—Potatoes with an immature skin as marketed from coastal districts are branded New Grade. Potatoes with a mature skin as marketed from tableland districts, No. 1 Grade.)

Inspections and Weight.

The weighing and inspection will be carried out on the arrival of the potatoes at the destination in New South Wales to which they have been required to be delivered by the Australian Potato Committee. Inspection will be carried out by an Inspector of the Department of Agriculture if one is available, but if there is none available it will be carried out by some person authorised by the Australian Potato Committee. If the potatoes are consigned to a destination outside the State, the weighing and inspection will be carried out at the point of loading or at the nearest place at which these services are available. The inspections and weights carried out at those places will be final.

Price.

The Australian Potato Committee guarantees to the grower that he will receive the price set out in the second schedule of the contract for his No. 1 and New Grade potatoes, but there is no guarantee for any other grade. If upon inspection the potatoes do not comply with No. 1 or New Potato grades, they may be reconditioned and the guaranteed price will apply to such quantity of them as after reconditioning does comply with No. 1 or New Potato grades. For potatoes that do not come up to these standards, the grower will be entitled to the actual market realisation less freight, commission and the usual marketing charges. The guaranteed prices are as follow:—

(i) For potatoes delivered to a railway platform or wharf at Sydney, £14 per ton, less charges for insurance and supervision of the reconditioning, if necessary, freight, inspection, weighing, unloading, wharfage, stacking and sorting.

(ii) For potatoes delivered to country destinations, £14 per ton, less the charges which would have been incurred in transporting such potatoes to Sydney wholesale market and in meeting the usual marketing charges exclusive of selling commission.

The grower will not be liable for any charges exceeding those which would have been incurred had the potatoes been delivered and sold in Sydney.

Purchase of Potatoes in the Ground.

The Australian Potato Committee may order the grower not to harvest some or all of his potatoes. The growers will then be entitled to be paid compensation for the potatoes not harvested in accordance with the Committee's instructions. This compensation will be paid on the estimated yield of the crop which has not been harvested in pursuance of these instructions. The compensation will be the amount of the guaranteed price less the following deductions:—

(i) the difference between the cost which would have been incurred in digging the potatoes and the cost of ploughing them out;
(ii) the cost of bags which would have been required to bag the potatoes;
(iii) the cost which would have been incurred in transporting the potatoes to the Sydney market, and in meeting the usual charges other than commission.

If the grower has already notified the Australian Potato Committee that his crop is ready to be harvested and has not received instructions not to dig within fourteen days, and he has dug and stored the crop or part of it, he shall in addition to the compensation already referred to be entitled to a fair allowance for the cost of digging and storing. These potatoes shall be the property of the Australian Potato Committee and shall not be dealt with by the grower except in accordance with instructions from the Committee. The estimated yield of the potatoes and the amount of compensation to be paid for them shall be determined by arbitrators, who shall be one representative of the Australian Potato Committee, one representative of the Department of Agriculture, and one represenative of the potato growers, and their decision shall be final.

Liens.

If the grower has given a registered crop lien over his potatoes, he will obtain no benefits from the contract until the holder of the crop lien and the Committee have entered into an agreement in writing relating to the marketing of the crop and the payment to the lienee of the amount due to him under his lien.

Notices.

Any notice, direction or consent required to be given by the Australian Potato Committee under the contract may be given by the Deputy Controller for New South Wales, or any other person authorised by the Committee. Such notice may be given through a Sydney daily newspaper or by letter addressed to the grower. Notices to be given by the grower to the Australian Potato Committee may be given to the Deputy Controller for New South Wales.

General.

1. Growers are advised to read the contract and the covering instructions very carefully.
2. Growers should watch the newspapers for information and instructions relating to the digging and marketing of potatoes grown under contract.
3. Growers should carry out exactly the instructions given by the Australian Potato Committee or its authorised officers.
4. If in doubt about the meaning of the contract or any other matter relating to the digging and marketing of the potatoes, growers should immediately consult the local departmental officer or the local Master Agent or write to the Deputy Potato Controller.
5. All the particulars required to be inserted in Schedule I of the contract should be given, and the contract should be signed by the contracting party and signature witnessed.

Approved Seed—August, 1943.

To assist in the production and distribution of approved seed of recommended varieties of crops and vegetables, the Department publishes in this list each month the names and addresses of growers of such seed. For this service a charge of 2s 6d. is made for each insertion of each variety listed. The number of varieties listed on behalf of each grower will be restricted to twenty-five for the time being. The Department may inspect the crop producing the seed, and in all cases a sample of the seed must be sent to the Department of Agriculture with information as to the location of its production, and must be accompanied by the fee indicated above.

If any seed producer does not wish to pay the advertising charge he may submit his name with the variety of seed and sample to the Department, and if it is approved his name will be listed in the Department and information will be supplied regarding it to inquirers.

Tomatoes—

Red Marhio No. 95—Rumseys Seeds Pty. Ltd., 331 Church-street, Parramatta.
Vetemold—Rumseys Pty. Ltd., 331 Church-street, Parramatta.
Potentate—Rumseys Pty. Ltd., 331 Church-street, Parramatta.

Cauliflower—

Shorts—H. Burton Bradley, Sherwood Farm, Moorland.

French Beans—

Brown Beauty—Mr. H. P. Richards, "Sovereignton," Tenterfield.
Granda—Mr. H. P. Richards, "Sovereignton," Tenterfield.

Garden Peas—

Greenfeast—Mr. S. Lee Archer, "Ebenezer," Tumorrama, *via* Tumut.

Varieties of Approved Seed Available.

In order that farmers may be directed to what are regarded by the Department as the most satisfactory local sources of approved seed of recommended commercial varieties of farm crops and vegetables, the Department is willing to supply information concerning such sources of seed of the following varieties:—

French Beans—

Tweed Wonder, Wellington Wonder.

Pumpkins.—

Queensland Blue.

Melon.—

Hawkesbury Wilt-resistant.

Grasses, etc.—

Phalaris tuberosa, Subterranean Clover (mid-season), Sheep's Burnet, Lucerne, Sudan.

NOTES CONTRIBUTED . . . .
BY THE BIOLOGICAL BRANCH.

VIRUS DISEASES OF POTATOES.

ONE of the most important problems in potato growing in New South Wales is the "running out" of stocks, or progressive decrease in yields, usually experienced when varieties are grown year after year. This is due to virus, or "degeneration" diseases which spread through the crop unless special precautions are taken to control them. A number of different viruses attack the potato plant singly or in combination, and the severity of the diseases they cause depends on the variety of the potato and the conditions under which the crop is grown as well as on the kind of virus.

A wide variety of symptoms is shown by virus-affected plants, but dwarfing and the rolling, mottling or crinkling of the foliage, and the production of numerous weak shoots are the most common signs. According to the type of symptom shown the diseases have received different names. In Factor, the variety most widely planted in New South Wales, leaf roll is the most important virus disease, but in other varieties mosaic may be a serious cause of loss. Leaf roll and mosaic are carried over from crop to crop in the tubers, and are spread through the growing crop from diseased to healthy plants by means of aphids. Bronze or spotted wilt may also be of importance, especially in crops near to cities or large towns.

Leaf Roll.

The name is descriptive of the disease. The leaflets of infected plants are rolled upwards along the margin, and in severe cases may become almost tubular. If infected seed is planted, the first signs of the disease appear about 3 weeks after the plants are above ground. The lowest leaves become thickened and leathery and commence to roll upwards at their margins. Later the rolling may extend upwards so as to involve most of the leaves. The rolled leaflets are stiff and rigid, and have a tendency to stand more erect than normal, giving the diseased plant an erect, stiff habit. Owing to their thickness and leathery texture, the leaves have a characteristic rattle when brushed with the hand and are harsh to the touch.

Affected plants are otherwise healthy, and there is no stem rotting, tuber decay, or premature yellowing and death of the foliage—symptoms seen in other diseases which may, under some conditions, cause a type of leaf

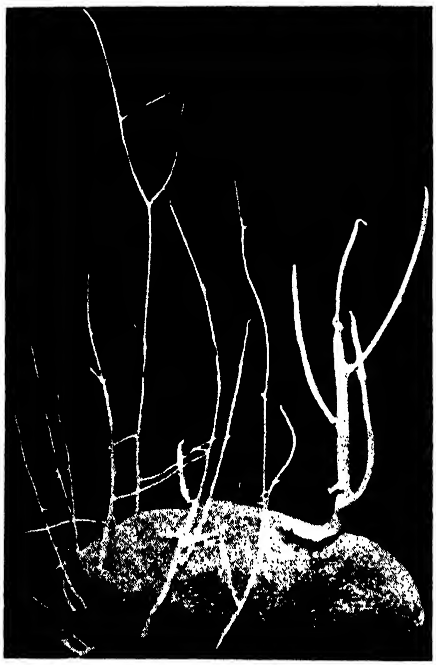
Effect of Leaf Roll on Factor Potato Plant.
***Left.*—Healthy plant. *Right.*—Diseased plant.**
Note the stunted, upright appearance and rolling of leaflets on the diseased plant.

rolling (*see* Plant Disease Leaflet 88). Drought and excessive heat may also cause rolling of potato foliage.

Tubers from plants affected with leaf roll cannot be distinguished with certainty from healthy tubers, but sometimes show the development of spindling sprouts. The yield may be reduced by one-half or more by leaf roll.

Mosaic.

Mosaic disease is so called on account of the mosaic-like pattern or mottling of the leaves of affected plants. A mottled pattern of yellowish-green and dark green is most usual, on the upper surfaces of the leaves, and may be accompanied by puckering and



Spindling Sprouts, a Symptom which Frequently Accompanies Leaf-roll.
[*After Heald.*

wrinkling and reduction in size. The mottling is most easily detected if the plants are examined in the early morning or on dull days.

Several tyes of mosaic disease are recognised, *e.g.,* rugose mosaic, mild mosaic, aucuba mosaic, etc., and they vary considerably in their effects on yield.

Witches' Broom.

Plants affected with this disease produce numerous weak stems and small leaves. As a rule they yield a large number of tubers, but none, or only a few, are of marketable size. When sprouted the tubers produce numerous slender shoots.

Bronze Wilt.

This virus disease is spread from diseased to healthy plants by thrips. Tomatoes, lettuce and many ornamental plants and weeds are subject to the disease and may act as distributory centres for it. The symptoms are brown, dead spots or rings which appear on leaves, the effect being most severe on the younger leaves, which may be killed. The disease extends to the shoot apex, causing blighting and death. The severity of the disease depends on the age of the plant at the time of infection. Old leaves may show only zoned brown spots.

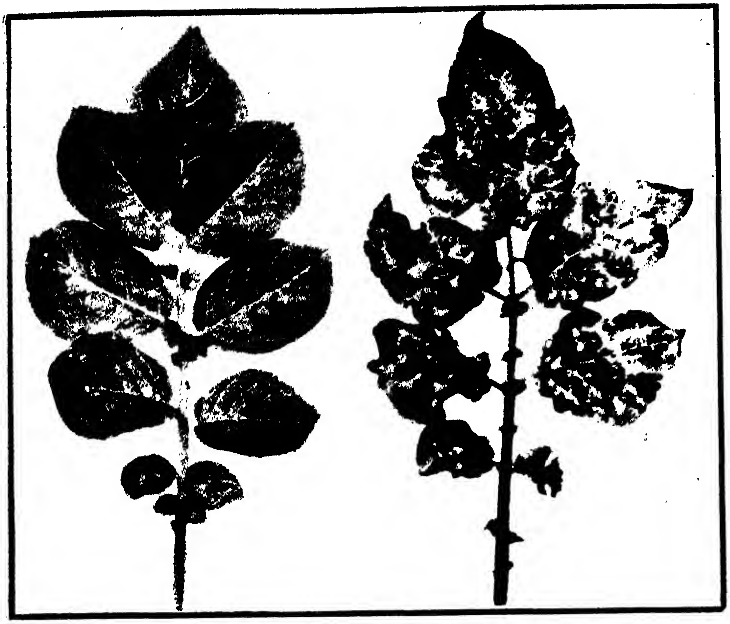
CONTROL MEASURES.

In localities where insects are very prevalent, and in general in regions of low altitude, potatoes degenerate rapidly. This applies to the coastal districts of this State, which for this and other reasons, are unsuitable for seed-production. Coastal growers should plant only "certified" seed from one of the tableland potato seed-growers' associations, though seed saved from a spring planting from certified seed will usually be satisfactory for the following autumn crop.

Localities subject to heavy winds are suitable for seed growing, as the winds prevent the migration of the aphids. This has been demonstrated strikingly in England over the last few years. Before the war most English seed potatoes were imported from Scotland, but the need for greatly increased quantities of seed potatoes prompted a search for further seed growing areas, and it was found that areas of windswept country adjacent to the sea in South-west England were equally suitable for the production of high grade seed.

The control of potato virus diseases lies primarily in the selection of disease-free seed, since it is from the seed that infection originates each year. It is not sufficient to select seed in the barn, since leaf-roll and mosaic cannot be detected with certainty in the tubers. Further, a large percentage of the tubers derived from infected plants, being small, are of such a size that they would normally be selected as seed.

The idea is prevalent that any lot of potatoes of uniform type and small size will



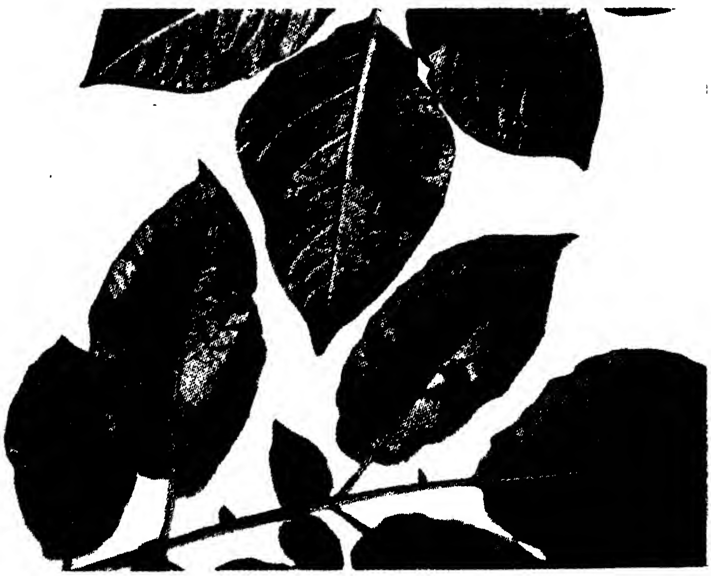
Leaves from Healthy and Mosaic Plants.
[*After Johnson.*

make good seed. If it were not for the general prevalence of degeneration diseases, seed might well be selected on this basis of size, but at the present time this method cannot be too strongly condemned.

Selection of seed should be carried out in the field, where the nature of the foliage may be used as a guide to what may be expected of the tubers selected. The following measures are recommended for use is tableland districts:—

(1) Maintain a stud seed plot.
(2) Cull out weak-shooted tubers before planting.
(3) Rogue virus-infected plants as early in the season as possible.

The Stud-plot Method.—The stud-plot method provides a means of eliminating virus diseases from a crop. In this method, the grower concentrates on improving a small portion of his crop by removing all infected and off-type plants, and then saves



Current Season Rugose Mosaic.

The burning of the veins and leaf blade is usually the first symptom shown when plants are affected during growth.

After McKay and Dykstra.

the entire yield of this portion for seed for the following year. Special attention must be given to this plot, which will occupy about one-tenth of the total area under potatoes. It should be isolated as far as possible from other potato crops grown on the farm or neighbouring farms to reduce the chance of

Rings of Dead Tissue, caused by the Bronze Wilt Virus.

insect transmission of disease. The distances virus diseases may be carried vary under different conditions, but a distance of 75 to 100 yards should afford ample isolation. Any necessary fencing should be attended to before planting in order to keep live-stock out of the plot.

The seed used in planting the stud-plot should be of the best quality procurable, both in freedom from disease and trueness to type. "Certified" seed of most of the popular varieties is now available.

Before planting, the seed should be dipped is corrosive sublimate (*see* Plant Disease Leaflet 35). While sprouting, the seed should be examined for the presence of aphids, which may be easily killed by spraying with nicotine solution. Weak-shooted tubers should be culled.

"*Roguing*," or the eradication of all diseased plants, is the most important operation in the handling of a stud seed plot. The plot should be gone through very carefully at least three times—once when the plants are about 9 inches high, again at blossoming time, and later before the tops have begun to die off. Undesirable plants of all types should be removed, their tubers being carefully dug out.

The efficiency of roguing can be increased if the stud plot is planted in "tuber-units," *i.e.*, planting all sets cut from a single tuber one after another in the row. For this method, medium sized tubers that will provide four sets are chosen. The tubers are cut partly, but not completely through, in two directions at right angles so that the sets hang together. The partly-cut tubers are laid in boxes which are moved along the furrow when planting. The tubers are broken apart into sets and are spaced 15 inches apart with a 30 inch space between each four sets. Tuber-unit planting enables more accurate roguing, and fewer centres of infection are established throughout the plot. In roguing a plot planted in tuber-units, all sets within a unit should be removed should a virus disease appear in any of the early roguings.

Cultivation of the stud plot should be very thorough, since weeds harbour aphids—the most important agent in transmission of virus diseases. It is preferable that the plot be located on good soil, since a high yield is desirable. All tubers from the stud plots, including table size, should be used as seed for the next season's crop.

Rust on Early Coastal Peach Varieties.

LEAF rust, especially when spring weather is damp, causes much premature defoliation of early coastal peach varieties. This exposes the limbs to summer sunscald and paves the way for the entry of wood-rotting fungi.

The first foliage spray should be applied during the first week of September. Colloidal

(*Continued on page* 372.)

SOME NOTES ON . . . .

FRUIT TREE IRRIGATION

On the Murrumbidgee Irrigation Area.

J. R. DAVISON, Fruit Inspector.

The Moisture Requirements of Orchard Trees.

IT has often been said that instruction and advice with regard to the irrigation of orchard trees under Murrumbidgee Irrigation Area conditions fail because no attempt is made to define moisture requirements in so many inches. Many opinions as to this figure have been expressed, and these vary from 20 to 35 inches annually, as rain and irrigation combined. In another State an authority* has indicated his belief in a range of from 30 to 45 inches, and has stated that citrus require more than any other variety of trees. It is known, however, that the latter is not the case as far as the Murrumbidgee Irrigation Area is concerned; in fact, through using rotations for general watering of the orchard, over-irrigation of the citrus trees has occurred simultaneously with under-watering of stone fruits.

A Clean Head Ditch
For handling large heads of water.

The very divergence of opinions only tends to stress the fact that it is utterly impossible to prescribe in general terms the amount of water to be applied. There is a general principle to be followed, it is true, but there are as many variations to this principle as there are orchards on the Area. This principle, put briefly, is that moisture requirements must be

*F. R. ARNDT.—"The Culture of Citrus Fruits in South Australia."

studied from the day that the individual tree is planted. Irrigation must depend entirely on the needs of these trees as they age, so that at no time will the root zone be over-wet, and so that this zone is properly explored and utilised before further water is applied.

Rainfall as it Affects Irrigation.

During the growing season, a 2-inch fall of rain has a much more beneficial effect on the trees than a similar amount of irrigation. Consider the difference between the two. While rain is falling, the air is saturated and no transpiration from the leaves takes place. It is the opposite during an irrigation; then, the air is usually dry and hot, often there is a desiccating wind blowing, and transpiration is at its peak. At the same time, moreover, the intake is slowed up by the temporary saturation of the root zone. This effect has been discussed elsewhere* at length, and mention will also be made of it later. The rate of intake during the day varies through extremely wide limits, early morning being the least. On a hot summer day the intake is tremendous.

Water requirements of trees are such that anything less than about a 2-inch fall of rain should not be allowed to displace an irrigation, unless there is a danger of applying too much, which might be the case with the more permeable soil types on slack grades. Where it is hard to apply less than 2 inches, it is advisable to postpone the irrigation until the soil has dried out sufficiently.

Soil Types and Penetration.

Most irrigators are now fully aware of the important effect that soil type and slope have on penetration rates. Most orchards have a wide variety of soil types, and it is rarely found that the heavier phase is at the top of the water run. Usually it is the reverse. Efficient grading and levelling, shorter water runs, improved methods of application, and adequate head in both supply and farm ditches, can, in various combinations, overcome this difficulty to a large extent. There is sometimes room for a change in design, but it is not always advisable or even necessary blindly to shorten the water run, as in some cases this might be more detrimental to the health of the trees than the longer run.

It should not be assumed that every section of a given soil type will absorb moisture at the same rate, for penetration rates are also affected by cultural practices, timing of tillage operations, and the mechanical condition of the soil at the time of irrigation. In testing for penetration, each case must be tried on its merits.

This variation in a soil is typified by a recent experience in an orchard. The block was watered at right-angles to the usual direction, and the penetration in the old "bone" was nearly four times as great as in the old run. Too many such applications would soon build up a water-table and generally cause trouble.

Soil Type and its Effect on Tree Growth.

It is probable that the limiting effects of soil type on the size and thrift of a tree are not fully realised in all instances. On the Area the size of the tree varies greatly with the soil type, and over the thirty years that trees have been planted, the deep, free soils have always produced the best trees. These soils have been described as "deep and fertile light soils." No doubt they were originally, but it is also true that these soils leach more quickly than the heavier loams, and so tend to become less productive. The poor prices realised for fruit during the "depression" years had a great bearing on the decline of tree health. At that time, owing to lack of finance, fertilising on the necessary scale was generally out of the question, and the trees were "flogged" with water in an attempt to boost production to meet commitments.

It seems that the quicker response of trees in light soils is due to the greater freedom of movement of water in those soils. The very low wilting point of a light soil affords a greater reservoir of water, and more rapid absorption gives a quicker return to equilibrium after an irrigation. Roots in a friable soil have a readier access to moisture, and thus the temporary drought that can be experienced by a tree during very hot weather when the transpiration rate is greater than the intake, is rarely experienced. Where these short setbacks are experienced they all affect the tree, although it may take years for the damage to show up.

---

* BOWMAN, F. T., and DAVISON, J. R.—"Prunes at Yenda." *Agric. Gazette*, vol. 52, p. 543.

This condition occurs when the root system is impaired by excess water, as is well known, but it also occurs where, owing to restrictions of soil type and in some cases root-stock, the top and roots do not balance. For instance, the alternate cropping habit and decline of most prunes is due in no small measure to keeping them dry through their prolonged harvest, and this in its turn is affected by the shallow rooting habit of the stock in all but the lightest of soils. Heavy dressings of artificial fertilisers alone do not solve the problem, for the intake of nutriment is also retarded by the slower intake of the roots. The following example will demonstrate the point.

In an orchard which has been the subject of experiment during the last few years, the soil types range from a deeper phase of Griffith loam to a poor, windswept Griffith clay loam. The irrigation layout is such that there is complete control of the amount of water applied. An even cover of 3 inches of water was applied over the whole of the grove, no section taking more than 30 minutes to finish. The lighter soil showed free water for no more than about 6 hours, whereas the stiffer parts of the block were wet for up to 60 hours.

Land Prepared for Irrigation During Harvest.
Bay divided into three

Irrigation by Crowder Method of Controlled Flooding.

The resultant penetrations after three days were 40 inches in the loam and as low as 12 inches in the clay loam. This actual difference in the amount of water absorbed into the soil which must have gone on for many more years than have been noted, shows up in tree growth and thrift, although the trees have all had equal amounts of fertiliser throughout. Improvement in penetration has been achieved throughout the

block, by grading and changed methods of culture and irrigation, but the greatest improvement so far has been in the lighter soil.

There are times during heat-waves when trees wilt despite the fact that there is moisture in the root zone. Irrigation at this time does not relieve the distress, as does water applied to a wilted soil under more moderate demands for moisture, because the trouble is not so much lack of moisture as lack of a root system equal to the demands of the tops. The wilted condition will continue, if the trees are watered, until the excess evaporates and drains away, that is, until the soil returns to the condition known as "capacity." Irrigation can be given, but it must be light, and not necessarily applied to the whole of the surface, as the object is not to make up the water content of the whole root zone to capacity, but to carry the trees until such time as the lower roots will have dried out their field of action, when the proper full watering will be done.

This condition will occur almost every harvest with stone fruits, and is the only time when it is advisable, under normal conditions, to deviate from the rule of letting the soil dry well before applying an irrigation.

The "Balanced" Tree.

What is required then is a "balanced" tree, with a reserve of roots sufficient to meet the sudden demands for moisture that occur during the inevitable heat waves which are a part of the Area summers.

(*To be continued.*)

Control of Over-wintering Codling Moth.

P. B. MACKENZIE, Fruit Inspector.

GROWERS should make every effort, before it is too late, to make a final clean up to destroy over-wintering codling moth larvae.

All cases or other containers which have held fruit should be dipped in boiling water for 3 minutes. The larvae of the codling moth will work its way between the joints of cases, and sufficient time must be given for the boiling water to penetrate. All bags used for packing benches, etc., should be either dipped or burnt.

Removal of Bandages.

Bandages should be removed from the trees, and any larvae therein destroyed. If the bandages are of sacking, they should be dipped in boiling water for at least 3 minutes or burnt. If made of corrugated strawboard, they should be destroyed by means of a fire carried in a bucket as taken off the trees.

Examining the Trunk of a Tree for Codling Moth Larvae.

At the same time any rough bark can be removed.

Examine Trees Carefully.

When the bandages have been removed, the tree should be carefully inspected, and

Cavities on the Trunk and Limbs should be Examined and Sheltering Larvae Destroyed.

Removing Soil from Around the Base of the Tree Enables the Destruction of Many Larvae.

all cavities along the trunk, limbs and crown of each tree carefully examined for over-wintering larvae. As far as possible, trees should be kept free of rough bark.

The soil should be removed from around the trunk of the tree to a depth of a couple of inches, and larvae located destroyed. Many over-wintering grubs take shelter at this point, and it is a spot which is often overlooked by growers.

It must always be borne in mind by growers that it is the over-wintering larvae that start the new season's infestation.

Management of Autumn-sown Lucerne.

LUCERNE sown last autumn should not be cultivated until the spring at earliest. The young plants are tender, and will not stand rough handling. On friable, loose soil, especially, the effect of cultivation would be to pull many of the plants out, and consequently the harrowing must be light, and should not be attempted until the roots have a firm hold; but after the second cut, particularly on ground that sets hard, the harrow can be used.

The method of keeping early spring weeds in check is to mow frequently. The mower should be put over the crop before any of the weeds have commenced to flower, and the operation should be repeated if required a month or two afterwards. Two mowings will generally be sufficient. They must not be omitted if weeds are getting a foothold, even if the lucerne is not ready to cut, as the object is to destroy the weeds. If the quantity should warrant it the cut material can be raked for green feed or for silage.

Established Stands.

Once lucerne becomes well established its vigorous growth keeps most weeds in check, but a certain amount of cultivation is necessary. A rigid-tine cultivator fitted with special lucerne points is the most suitable implement. The lucerne field should be given a thorough stirring with this in July or August, and if necessary again later in the season. The loosening of the surface allows moisture to percolate to a greater depth, and prevents it from flowing away over the surface. Owing to the depth to which even light showers then penetrate, less loss occurs through evaporation.

Alteration in Superphosphate Ration.

THE manufacture of 18 per cent. superphosphate has been suspended temporarily owing to interruption in supplies of raw materials, and from the 1st August 22 per cent. grade superphosphate will be available, but will be reserved for priority crops only.

The price of this has been fixed at £6 6s. per ton on rails at works, or £1 above the present price of the standard 18 per cent. grade.

The ration for priority crops will be calculated on the phosphoric acid content and will be 18/22nds of the present allotments.

As soon as the raw material position permits, the manufacture of the standard 18 per cent. superphosphate will be resumed, and supplies made available for crops in addition to those having priority.—A. W. S. MOODIE, Fertiliser Rationing Officer.

INSECT PESTS.

Notes contributed by the Entomological branch.

THRIPS.*

(*Thysanoptera.*)

THRIPS constitute a group of specialised insects of considerable importance to orchardists, vegetable growers and horticulturists, as the flowers, fruit or foliage of various crops and ornamental plants, etc., are subject to attack. In many instances the injury does not become apparent until the insects responsible have departed.

There are many kinds of thrips which cause economic losses, and on account of their comparatively small size they may pass unnoticed, even when present in large numbers. Most thrips of economic importance range from about one-twenty-fifth to one-fifteenth of an inch in length. The adults usually possess two pairs of narrow wings which are fringed with long fine hairs, and lie flat along the back when at rest.

The adult females, depending upon the particular species, either possess a tubular ovipositor and lay their eggs upon the surface of their host plant, or bear a serrated, or saw-like, ovipositor, and deposit their eggs singly in slits in the plant tissues. Most of our pest species belong to this latter group.

The young resemble the adults in general form and method of feeding. There are usually two larval stages, both wingless. The first stage larva is very minute, but the second stage larva, when fully-fed, is almost as large as the adult. The immature forms frequently differ markedly in colour from the adults, and in some species are whitish; others may be various shades of yellow, and some are bright red. After moulting the fully-fed larvae enter a prepupal stage, and after a further moult enter the pupal stage. In both these latter stages, wing-buds are present and the insects are capable of movement if disturbed. The prepupal and pupal stages are usually passed either in the soil or beneath debris, but a few species pass these stages on the infested plants.

While some species have only one generation a year, many of the pest species pass through a number of generations during the summer months. The winter may be passed in either the larval, pupal or adult stages, depending on the species.

Some species, of which the common plague thrips is typical, attack the blossoms of fruit trees, vegetables, ornamental garden flowers and weeds, and through feeding in these situations may prevent the setting of fruit or seeds by destroying the stamens or pistils, or may destroy the appearance of garden flowers. Other thrips feed on the very young fruits, which as a result of the destruction of the surface cells, become extensively covered with silvery markings. Where bean blossoms are attacked the pods may not set, or if they do, they may be considerably curled and distorted.

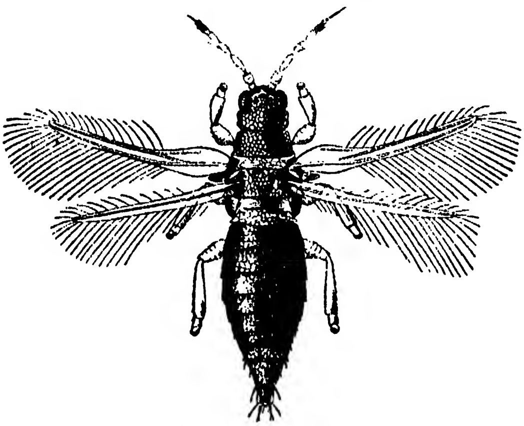
The Plague Thrips.

* The name thrips is derived from a Greek word of only four letters, and represented by English sounds these letters become th-r-i-ps. A single individual of this group, therefore, should always be referred to as a thrips. The word thrips is thus both singular and plural.

The most serious damage to ornamental shrubs results from thrips feeding on the young leaf-buds, thus producing a twisted and abnormal leaf and twig development. The older leaf surfaces may become extensively silvered and rendered unsightly.

The gladiolus thrips attacks all parts of gladioli, including flowers, leaves and corms.

In addition to those species which attack growing plants, there are other thrips which frequent moist, decaying, plant remains, dead leaves, wood and fungi; and others again which, at times at least, are predaceous and suck the body fluids of aphids and various mites. There are also gall-forming species, in which the whole brood of larvae develops within the gall cavity.



The Black Thrips.
[After Weigall.

Some species of thrips are known to spread virus diseases by migrating from infected plants and feeding on healthy ones.

A thrips' mouth parts consist of a series of delicate, piercing stylets enclosed in a short, sucking tube or mouth-cone. When feeding, the stylets are first driven into the plant tissues, and as the cell-sap escapes through the minute puncture, the apex of the mouth-cone is applied to it, and the plant juices are pumped up through the tube by means of special muscles.

The Plague Thrips (*Thrips imaginis*).

This native thrips, which is probably the most important economic species in New South Wales, may occur in plague numbers in the spring and early summer, when the climatic conditions are favourable for its development. This species is present every year in limited numbers, but serious spring outbreaks have been found to follow on an autumn and winter in which the rainfall has been above the average. Subsequent weather conditions, including temperature and rainfall, also influence the abundance of the insects. With a decrease of soil moisture during the summer months, they no longer occur in plague numbers.

The adult thrips, which measures slightly less than one-twenty-fifth of an inch in length, is light brown in colour. It feeds in the blossoms of weeds, fruit trees, vegetables and ornamental garden plants. Apples, pears, peaches, and plums may be heavily infested, and the injured blossoms may turn brown and fall prematurely, thus preventing the setting of the fruit. Citrus and grape blossoms may also be attacked, but the setting of these fruits is not affected to any extent. Garden flowers, particularly roses, may be seriously damaged. The thrips entering the opening blossoms and feeding on the petals, causes them to turn brown and the dark excrement on light-coloured blooms adds to the disfigurement.

The minute, transparent eggs are laid in all parts of the flowers, and also in the young leaves adjacent to the blossoms of the fruit trees, and while the immature forms may feed upon the young leaves, they usually cluster inside the blooms where they feed mainly on the stamens. There are two larval stages, during the first of which the insects become yellow, and in the second orange-yellow. When fully-fed the larvae pass down into the soil, where they enter their prepupal and pupal stages. Later, they become adult, make their way to the surface and fly back to the blossoms.

The life-cycle, from egg to adult, may vary from about ten days to a month or more, depending largely on temperature.

The Black Thrips (*Heliothrips haemorrhoidalis*).

This cosmopolitan species is frequently referred to in literature as the "greenhouse thrips," but in this State it is primarily an out-of-doors pest. It commonly attacks various ornamental shrubs and fruit trees, particularly persimmons and to a less extent citrus. In the latter case late hanging fruit may be extensively silvered, especially

where it is closely overhung by leaves. Azaleas, fuchsias and viburnum are often seriously injured.

This thrips feeds principally on the foliage of the plants, usually in compact colonies, and rapidly produces the characteristic silvering of the leaf-surface on which are to be seen the typical brown or black dots of excreta. In later stages of infestation the thrips feed on the upper leaf surfaces.

The adult thrips, which measures about one-twentieth of an inch in length, is dark brown to black, with the end of the abdomen much lighter, and although winged, rarely flies.

The eggs are inserted in the plant tissues, and all stages, including both the prepupal and pupal, are passed on the infested plants. The larvae are at first white, but later become yellowish. A number of generations occur during the year. In California the incubation period under optimum conditions lasts seventeen to twenty days, and the complete life-cycle may be passed in thirty-three to thirty-eight days.

This species prefers shady, cool and fairly moist conditions; hot, dry weather, or heavy rain adversely affects it in the open.

The Gladiolus Thrips (*Taeniothrips simplex*).

This species has a somewhat restricted range of food-plants; while preferring the gladiolus, it has sometimes been found infesting iris, calla or arum lily, torch lily or "red-hot poker" (*Kniphofia* sp.), montbretia (*Tritonia* sp.), tiger flower (*Tigrida pavonia*) and carnations.

An account of the life-history of this thrips, together with control measures, is given in Insect Pests Leaflet No. 55, which is available on application to the Under Secretary, Department of Agriculture, Box 36A, G.P.O., Sydney.

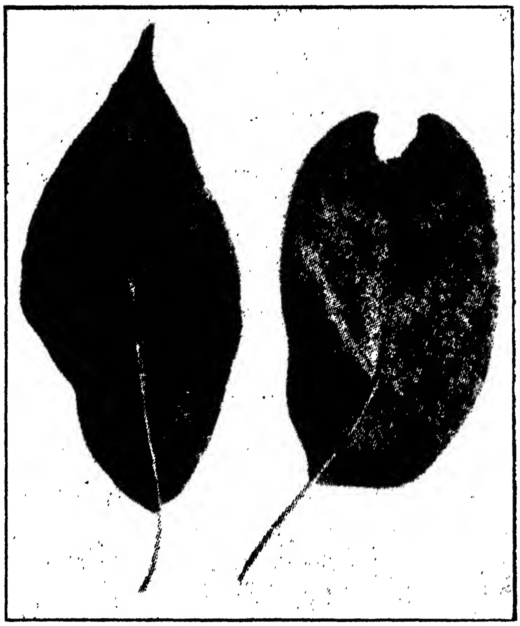
Tomato Thrips.

Measures for the control of thrips on tomatoes are given in Insect Pests Leaflet No. 72, which is also available on application to this Department.

CONTROL OF THRIPS.

It is impossible to make general recommendations for the control of thrips as a group. The measures to be adopted depend upon the particular species of thrips concerned and also on the types of plants attacked.

It should be remembered that as the eggs of most of the pest species are laid within the plant tissues, they are largely protected, and therefore a second treatment should follow the first, sufficient time being allowed to elapse for the hatching of the eggs. This will vary with the species, and with the season of the year, but in general, an interval of two weeks between treatments should prove satisfactory. This will also kill adult thrips which may have emerged from pupae protected in the soil at the time of the first treatment.



Leaves Showing Typical Thrips Injury.
[After Bailey.

With the plague thrips and other blossom-infesting species, which prevent the setting of fruit, the aim of any treatment is not only to kill the thrips present in the blossoms, but also to prevent reinfestation. At the present time there is no entirely satisfactory treatment for this purpose. It is always extremely difficult, if not impossible, to reach thrips with either sprays or dusts when they are sheltering within partly-opened blossoms or leaf-buds or within leaf-sheaths.

The following are some of the treatments that are recommended:—

Contact Sprays.

(1)	Derris	2 oz.
	Soap	2 oz.
	Water	4 gal.
(2)	White oil emulsion ..	10 fl. oz.
	Nicotine sulphate ..	1 fl. oz.
	Casein spreader ..	½ oz.
	Water	4 gal.
(3)	Kerosene emulsion ..	(1-30)
(4)	Nicotine sulphate ..	1 fl. oz.
	Soap	2 oz.
	Water	4 gal.

Foliage Poison Sprays.

(1)	Paris green	½ oz.
	Sugar	2 lb.
	Water	3 gal.
(2)	Tartar emetic	1 oz.
	Sugar	4 oz.
	Water	4 gal.

Dusts.

(1)	Derris	1 lb.
	Kaolin or talc	8 lb.
(2)	Pyrethrum	1 lb.
	Kaolin or talc	1 lb.
(3)	Nicotine dust ..	2½ per cent.

The Grape Vine Moth. (*Phalaenoides glycine.*)

THE caterpillars of this moth are one of the most common pests of the grape vine, and if allowed to remain unchecked may seriously damage the young bunches and defoliate the vines. In addition, they also feed upon the leaves of fuchsias, and these plants at times are completely defoliated by them. The recorded native foodplants are *Gnaphalium luteoalbum, Hibbertia linearis* and *Glycine* sp.

These day-flying moths, which measure about 2¼ inches across their outspread wings, are black with yellow markings. The male may be distinguished by the presence of a distinct yellow spot in the middle of the upper surface of the hind winds.

The eggs which are somewhat flattened, and finely ridged, are deposited on the stems and leaves.

The fully-fed caterpillar measures about 2 inches in length and is greenish-yellow, marked with numerous short, transverse, irregular black lines and several reddish spots. Large larvae may be collected in August and September and again in December.

The pupal or chrysalis stage is passed in the ground within a cell, but under certain conditions the larvae may cement leaves and rubbish together and pupate therein. Pupae may overwinter in the soil, moths emerging from them in the spring at about the time the vines come into leaf. The pupa is dull reddish-brown, and measures slightly less than 1 inch in length. Several generations occur during the summer months.

The caterpillars are sometimes attacked by a small Eulophid wasp parasite, the larvae of which are gregarious external feeders. A predaceous pentatomid or shield bug, *Oechalia consocialis,* also destroys the caterpillars, and a minute chalcid wasp, at times, develops in the moth's eggs.

The Grape Vine Moth.

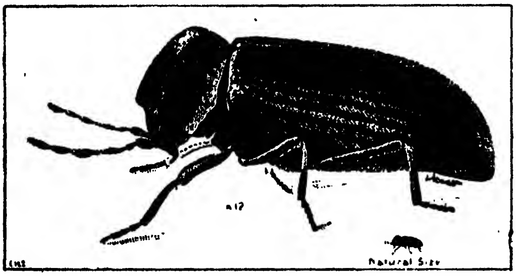
Control.

Thorough spraying of the vines with arsenate of lead at the rate of 1 lb. of arsenate of lead powder to 40 gallons of water will control the caterpillars. Spraying should be carried out in the spring when the caterpillars first appear on the vines, and should be repeated if they again become abundant later in the season.

In vineyards it is customary to combine the arsenate of lead with one of the fungicidal sprays.

The Furniture Beetle. (*Anobium punctatum.*)

A REMINDER is given that the adults of the furniture beetle will soon begin to make their appearance and may continue to emerge until January or even later. Timber that is known to have been infested the previous season or is likely to be infested, should be carefully watched for the presence of



The Furniture Beetle.

any new emergence holes. Emergence usually occurs at night, and at this time the adults may be found crawling on the outside of infested timber or nearby. In darkened or ill-lighted rooms emergence may take place during the day.

The dark brown beetles, which are of variable size, measure from one-tenth to one-fifth of an inch in length. The prothorax is large and overhangs the head like a hood. The eggs are laid in cracks, pores or holes in the wood or on the rough-cut ends of timber, and the larvae feed and tunnel within the timber for about ten months or even longer. When fully-fed they enter their pupal or chrysalis stage in the end of a tunnel, close to the surface of the wood, and about three weeks later become adults and gnaw their way out through the wood.

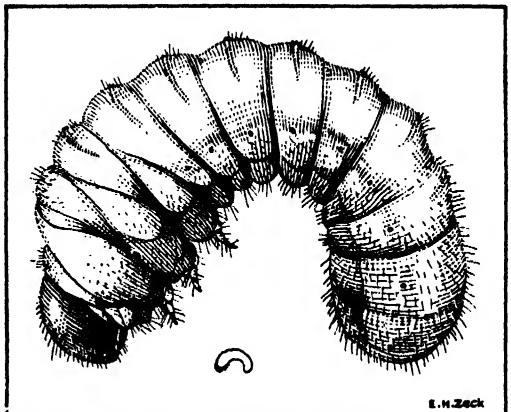
These beetles commonly infest shelving, flooring and household furniture constructed with various pine timbers, or other articles in which pine has been used. They sometimes also infest beech, willow, maple, walnut, etc., but are never found attacking local hardwood timbers.

Control.

Treating the infested timber with creosote oil during the spring months, prior to the hatching of the beetles is recommended.

Creosote oil produces a dark-brown stain, but it is the most effective substance for general application, and by mixing it with an equal quantity of kerosene the density of the stain may be reduced. Kerosene (½ pint) in which the fumigant paradichlorobenzene (1 oz.) has been dissolved may also be injected into the holes.

The oil may be either brushed or sprayed on, or injected with a syringe. Where a power syringe is used to inject oil into exit holes sufficient pressure may be exerted to cause the oil to percolate through the infested wood. After the treatment, some form of suitably coloured filler may be used to plug the exit holes of the beetles, and where this is done any new emergence holes may be readily detected.



Larva of the Furniture Beetle.

Any one treatment with chemicals may not give complete control. Perseverance and repeated treatments, at intervals throughout the season, may be necessary, and a close inspection of the timbers should be made the following spring.

Replacement of severely damaged timber may be preferable to continuous treatment.

Rust on Early Coastal Peach Varieties—(*Continued from page* 362).

sulphur (1-2 lb. per 100 gallons) or wettable sulphur (2-5 lb. per 100 gallons) is recommended. Lime sulphur should not be used.

Subsequent foliage sprays should be applied at intervals of three to four weeks until January, unless weather conditions are so dry that rust does not become serious.

The Procedure for Settling Disputes

Under the Agricultural Holdings Act, 1941.

J. R. BUTLER, B.A., LL.B., Legal Officer.

IN the May, June and July issues, Mr. A. W. S. Moodie, Senior Agrostologist, contributed articles dealing with farm tenancy in New South Wales, and in these, explained the rights and obligations of landlords, tenants and sharefarmers under the Agricultural Holdings Act, 1941. A concluding article of this series has yet to appear.

Provision is made in the Act for the settlement of any question, difference, dispute or other matter arising under the Act to be settled by arbitration. A list of these matters is set out in the article appearing in the July issue. The purpose of this present article is to describe and explain the procedure required by the Act for the settlement of disputes.

In England the number of disputes which are referred to arbitration under the corresponding English Act is believed to be relatively few; that is, the landlords and tenants are able to settle amicably the various claims for compensation which arise. It is hoped that a similar position will prevail in New South Wales and that the parties, either with or without the aid of valuators, will be able to come to an agreement as to the amount of money to be paid as compensation for improvements, tenants' fixtures and the like. In the case of compensation for disturbance a basis of settlement is provided by the Act itself, namely, a minimum of one year's rent and a maximum of two years' rent.

However, if the parties cannot reach a satisfactory agreement, the dispute must be referred to arbitration under the Act; there is no other lawful method of settling these disputes. Incidentally the only disputes or questions which can be referred to arbitration under the Act are those which by the Act are expressly required or permitted to be referred to arbitration (*see* Section 17). Other disputes and questions, such as the interpretation of the contract of tenancy (including sharefarming agreements) and the exercise of remedies under it or under other statutes will still be determined by the ordinary civil courts as formerly, as Section 37 of the Act preserves the powers, rights and remedies of landlords, tenants and other persons except insofar as they are not expressly affected by the Agricultural Holdings Act, 1941.

In the Second Schedule to this Act are set forth the rules as to the determination of disputes and these are repeated hereunder. (See page 374). Regulations were made under the Act and published in the *Government Gazette* on 16th July, 1943, relating to the procedure required to initiate arbitration proceedings and prescribing certain forms for use under the Act. These also are repeated hereunder (page ——).

These rules and regulations are simple but the following information may be useful.

Appointment of Agricultural Committee. (Rules 1-6).

Nominations of landlords and tenants for appointment to the appropriate panel have been received from various farmers' organisations, and appointments to the panels have been made by the Minister. Additional nominations of landlords and tenants willing to act may still be made.

When a dispute arises the party who desires it referred to arbitration is required to give a form of notice of dispute (*see* Regulation 2 and Form 1), but it is suggested that the first step taken should be to write to the Department of Agriculture advising it of the dispute and giving the name and address of the other party. The form of notice of dispute will then be supplied, with full instructions, and a copy of the appropriate panel will also be forwarded to him and to the other party. Each party is responsible for appointing his representative to the agricultural committee, and arranging with him the amount of remuneration and the time and manner of payment (*see* Rules 5 and 6). This remuneration is not to exceed the amount fixed by the Minister, either generally or in any particular case, and the Minister has fixed generally the following scale of fees:—£1 1s. 0d. for a sitting up to 1 p.m., £1 1s. 0d. for a sitting between 2.0 p.m. and 6.0 p.m. and £1 1s. 0d. for a sitting after 7.0 p.m., plus reasonable out-of-pocket expenses. These fees are identical with those payable to members of a local land board (other than the chairman).

It is desirable that the persons appointed by the parties live close to the holding in respect of which the dispute exists and, if there is no person on the panel who is conveniently located, it is open to either party to nominate some suitable person for appointment by the Minister.

When each party has appointed a member of the committee, he should notify the Minister of the member's name and address. If one party fails to appoint a member to the committee within fourteen days after being called upon by the other party so to do, the Minister on being so requested will make an appointment on behalf of the defaulting party (*see* Rule 1 and Regulation 3). It will be advisable for the person seeking the arbitration, to give notice to the other party as soon as possible, requiring him to appoint a member to the committee so as to save time.

The Minister will appoint an officer of the Department to be Chairman, who will be responsible for arranging the time and place of the meeting and for giving notice thereof to the parties (*see* Regulations 4 and 5).

Time for Award. (Rule 7).

Copies of the award will be supplied to each of the parties (*see also* Rule 11).

Evidence. (Rules 8 and 9).

Each party to the dispute should bring before the committee all necessary documents and witnesses he requires to prove or deny the claim as the case may be. Each party will be responsible for arranging the attendance of his own witnesses. (*See also* Rule 17 and Regulation 6.)

Attention is drawn to Section 17(5) of the Act which prohibits a party from being represented by a barrister or solicitor.

Statement of Case. (Rule 10).

The procedure governing the submission of a special case to the District Court will be dealt with by appropriate District Court Rules. The form of stated case is prescribed by Regulation 8 and Form 3. The opinion of the District Court on a question of law submitted to it under this rule shall be final (*see* Section 17(4)).

Award. (Rules 11-15).

The form of award is prescribed by Regulation 7 and Form 2. By Section 18 (a) of the Act the amounts awarded in respect of the several claims referred to the committee are required to be separately stated. By Section 20 of the Act payment under the award is to be made within fourteen days after the date fixed for payment by the committee, and by Section 18(b) the committee may make an interim award for the payment of any sum on account of the sum to be finally awarded. If the sum payable is not paid within the period specified, it may be recovered as a debt in an appropriate civil court. (*See also* Section 19 as regards apportionment of compensation amongst several landlords of a divided holding.)

There is no appeal from the committee's decision on questions of fact (*see* Rule 12) but, if a member of the committee has misconducted himself or an arbitration or an award has been improperly secured, the District Court, on the application of either party, may set the award aside (*see* Rule 15).

Costs. (Rules 16 and 17).

The procedure for securing taxation of costs will be dealt with by appropriate District Court Rules. Rule 17 is important and parties should carefully note its provisions.

Forms 4 to 16 in the Schedule to the Regulations.

These forms, if used, shall be sufficient for the purpose indicated by the form (*see* Regulation 9). It is, therefore, not compulsory to use them, but any form of notice used should contain all essential particulars, otherwise any claim dependent upon the notice may fail. It is equally important that these notices should be given or served within the periods or at the times prescribed by the Act (*see* relevant sections) and that they should be properly served (*see* Section 36).

Rules as to Determination of Disputes.

The following rules as to determination of disputes comprise the Second Schedule to the Act:—

Appointment of Agricultural Committee.

1. An agricultural committee shall consist of three members.

Of such members—

(*a*) one shall be an officer of the Department of Agriculture, who shall be appointed by the Minister and who shall be the chairman of the committee;

(*b*) one shall be a person whose name is on the panel of landlords and shall be appointed by the landlord;

(*c*) one shall be a person whose name is on the panel of tenants and shall be appointed by the tenant.

In default of an appointment by either a landlord or a tenant within fourteen days after being required so to do by the other party to the dispute, that party may apply to the Minister to appoint on behalf of the other party a person from the appropriate panel and the Minister shall thereupon make such appointment.

Neither party shall have power to revoke the appointment of a member of the agricultural committee without the consent of the other party.

2. The panels of landlords and of tenants shall respectively consist of the names of persons appointed from time to time by the Minister.

3. The Minister may at any time remove any name from any such panel.

4. If a person appointed a member of an agricultural committee dies or is incapable of acting or refuses or fails to act on the agricultural committee, another person shall be appointed in his place as if he had not been appointed.

5. The remuneration of the members of an agricultural committee (other than the chairman) shall be such amount as is agreed upon between such person and the landlord or tenant, as the case may be, by whom or on whose behalf the appointment is made, but not exceeding such amount as may be fixed by the Minister, either generally or in any particular case.

6. The remuneration of a member of an agricultural committee (other than the chairman) may be recovered in any court of competent jurisdiction as a debt due to him by the landlord or tenant as the case may be by whom or on whose behalf the appointment was made.

Time for Award.

7. Except where otherwise expressly provided in this Act, the agricultural committee shall make and sign its award within fourteen days after the arbitration or within such longer period as the Minister may (whether the time for making the award has expired or not) direct.

Evidence.

8. The parties to the arbitration, and all persons claiming through them respectively, shall, subject to any legal objection, submit to be examined by the agricultural committee, on oath or affirmation, in relation to the matters in dispute, and shall, subject as aforesaid, produce

Growers find white maize pays better than yellow!

★

As a paying proposition maize growers are finding out that the large bold grain white sort beats the ordinary yellow maize hands down. This is because only the white sort is suitable for manufacture into high quality breakfast food. Kellogg's, makers of the famous Kellogg's Corn Flakes, pay handsomely for this type of white maize.

There is a large and expanding demand for Kellogg's Corn Flakes, which makes white corn a most valuable crop for any farmer to grow. With white corn on the plot the farmer has two strings to his bow; he can sell to the Corn Flake manufacturers who require white corn exclusively, and also the manufacturers of other corn products who can use both white and yellow. Why limit your market to one class? Grow white and make both markets available to you.

But remember, large full bodied white maize brings the best price for Corn Flake manufacture.

★

before the agricultural committee all samples, books, deeds, papers, accounts, writing and documents, within their possession or power respectively, which may be required or called for, and do all other things which, during the proceedings, the agricultural committee may require.

9. The chairman of the agricultural committee shall have power to administer oaths, and to take the affirmation of parties and witnesses appearing, and witnesses shall, if the chairman of the agricultural committee thinks fit, be examined on oath or affirmation.

Statement of Case.

10. The agricultural committee may at any stage of the proceedings, and shall if so directed by the judge of the District Court (which direction may be given on the application of either party), state in the form of a special case for the opinion of that court any question of law arising in the course of the arbitration.

Award.

11. The agricultural committee shall, on the application of either party, specify the amount awarded in respect of any particular improvement or any particular matter the subject of the award, and the award shall fix a day not later than one month after the delivery of the award for the payment of the money awarded as compensation, costs, or otherwise, and shall be in or to the effect of such forms as may be prescribed.

12. The award to be made by the agricultural committee shall be final and binding on the parties and the persons claiming under them, respectively.

13. In the case of any matter coming before an agricultural committee and the members are divided in opinion, the decision of the majority shall be the decision of the agricultural committee.

14. The agricultural committee may correct in an award any clerical mistake or error arising from any accidental slip or omission.

15. Where a member of an agricultural committee has misconducted himself, or an arbitration or an award has been improperly procured, the District Court may set the award aside.

Costs.

16. The costs of and incidental to the arbitration and award shall be in the discretion of the agricultural committee which may direct to and by whom and in what manner these costs or any part thereof are to be paid, and the costs shall be subject to taxation by the registrar of the District Court on the application of either party, but that taxation shall be subject to review by the judge of the District Court.

17. The agricultural committee shall, in awarding costs, take into consideration the reasonableness or unreasonableness of the claim of either party, either in respect of amount or otherwise, and any unreasonable demand for particulars or refusal to supply particulars, and generally all the circumstances of the case, and may disallow the costs of any witness whom it considers to have been called unnecessarily, and any other costs which it considers to have been incurred unnecessarily.

Interpretation.

18. In this Schedule "District Court" means the District Court having jurisdiction in the district in which is situated the holding to which the arbitration relates.

Regulations.

The following are the Regulations under the Act:—

1. In these regulations—

"Act" means Agricultural Holdings Act, 1941.

"Arbitration" means arbitration under the Act.

"Dispute" means any question, difference, dispute or other matter whatsoever which by or under the Act is required or permitted to be referred to arbitration.

"Schedule" means Schedule to these regulations.

2. Any landlord or tenant seeking the reference of a dispute to arbitration shall forward to the Minister a notice in or to the effect of Form 1 in the Schedule.

3. Where the Minister has, pursuant to an application made by a party to a dispute, appointed a person to act as a member of an agricultural committee on behalf of the other party to the dispute, he shall notify such other party of the name and address of the person so appointed.

4. The chairman of an agricultural committee shall fix the time and place for the hearing of any dispute and shall give notice to all the parties of the time and place so fixed. The notice to be given shall as far as possible be not less than fourteen days.

5. An agricultural committee may adjourn the hearing of a dispute from time to time and from place to place.

6. Documents which have been admitted as evidence by an agricultural committee shall be marked by the chairman as exhibits.

7. An award made by an agricultural committee shall be in or to the effect of Form 2 in the Schedule with such modifications of the terms thereof as circumstances may require.

8. The statement of a special case for the opinion of the District Court on a question of law arising in the course of an arbitration shall be in or to the effect of Form 3 in the Schedule.

9. Forms 4 to 16 inclusive in the Schedule shall, if used, be sufficient for the purpose indicated by each such form.

SCHEDULE.

FORM 1.

AGRICULTURAL HOLDINGS ACT, 1941.

Notice of Dispute to Minister.

To *The Minister for Agriculture and Forests.*

I hereby notify you that it is proposed to refer to arbitration under the Act the question, difference, dispute or matter specified hereunder arising out of the tenancy of the holding described hereunder, and I furnish the following particulars:—

Full name of landlord.
Address of landlord.
Full name of tenant.
Address of tenant.
Name and locality of holding.
Area of holding.
Purpose for which holding has been used by the tenant.
Nature of tenancy (*e.g.*, for term of years, at will, share-farming agreement).
Date of commencement of tenancy.
Date of termination of tenancy.
Dispute(s) to be referred to arbitration:—
(Here set out particulars of dispute(s)).

I appoint AB of .... to be a member of the Agricultural Committee.

*By notice dated the ....(copy herewith) I required CD to appoint a person to be a member of the Committee which he has failed to do and I hereby apply to you to appoint on behalf of the said CD a person to be a member of the Agricultural Committee.

*Delete if not required.

Signature ....
Date ....

FORM 2.

AGRICULTURAL HOLDINGS ACT, 1941.

Award.

In the matter of a holding known as .... situate at ....and (lately) in the occupation of AB of .... (the quitting tenant).

Whereas under the Agricultural Holdings Act, 1941, the questions, differences, disputes or matters set forth in the Schedule to this Award are referred to arbitration under the said Act and whereas we the undersigned were duly appointed under the said Act as an Agricultural Committee to determine the said matters:

And whereas the said Agricultural Committee has heard, examined and considered the witnesses and evidence concerning the said matters do make and sign this our award of and concerning the same in manner following, that is to say:

(Here set out details of award.)

In witness whereof we have hereunto set our hands this .... day of .... 19 .

Members of the ....
Agricultural ....
Committee. ....

FORM 3.

AGRICULTURAL HOLDINGS ACT, 1941.

Form of Special Case stated by Agricultural Committee.

In the matter of a proceeding before an Agricultural Committee, appointed under the Agricultural Holdings Act, 1941, to determine a certain question, difference, dispute or matter between AB of .... (Landlord) and CD of .... (Tenant).

Whereas under the Agricultural Holdings Act, 1941, a certain question, difference, dispute or matter set forth in the Schedule hereto arising under the said Act between AB of .... the Landlord of a holding known as .... and situate at .... and CD the tenant of the said holding was referred to the Agricultural Committee consisting of us the undersigned and whereas evidence was heard by the said Committee in the said matter on the .... and whereas there arose in the course of the arbitration the following question of law namely:—(Here state question of law).

And whereas the relevant facts proved in the proceedings are as follows:—(Here state facts).

And whereas the Committee is desirous of having the opinion of a District Court on the said question of law (or whereas His Honour Judge ....a District Court Judge, has directed that this special case be stated by us for the opinion of the said Court) now we the undersigned submit for the opinion of the District Court the question of law stated herein.

Schedule.

(Here set forth questions, difference, dispute or matter).

Dated the .... day of .... 19 .

Members of the ....
Agricultural ....
Committee. ....

FORM 4.

AGRICULTURAL HOLDINGS ACT, 1941.

Notice of intention to execute an improvement comprised in Part I or Part II of the First Schedule to the Agricultural Holdings Act, 1941.

(*Section* 8(1)).

To .... (Landlord)
of ....

With reference to the holding known as...... .... and situate at .... which I now hold of you as your tenant I hereby notify you that after the expiration of two months from the date this notice is given I intend to execute upon the said holding the improvement(s) described hereunder, namely:—

(Here describe improvement(s)).

Dated this .... day of .... 19 .

Signed ....
(Tenant).

FORM 5.

AGRICULTURAL HOLDINGS ACT, 1941.

Dissent by Landlord to Improvements comprised in Part I or Part II of the First Schedule to the Act. (*Section* 8(3)).

To .... (Tenant).
of ....

With reference to your notice dated the...... ......, notifying me of your intention to execute upon the holding known as .... and situate at .... which you now hold of me as my tenant the improvement(s) described in the said notice I dissent to such intended improvement(s) and require the matter in difference to be referred to arbitration under the said Act.

Dated this .... day of .... 19 .

Signed ....
(Landlord).

FORM 6.

AGRICULTURAL HOLDINGS ACT, 1941.

Notice of Intention to claim Compensation for Increased Value by adoption of special system of farming (Section 13(1) (b)).

To .... (Landlord).
of ....

With reference to the holding known as .... and situate at .... which I now hold of you as your tenant I hereby notify you that it is my intention to claim from you under the Agricultural Holdings Act, 1941, compensation for the value to an incoming tenant of the adoption by me during the tenancy of a standard of farming or a system of farming which has been more beneficial to the holding than the standard or system required by the contract of tenancy.

Dated this .... day of .... 19 .

Signed ....

(Tenant).

FORM 7.

AGRICULTURAL HOLDINGS ACT, 1941.

Notice of intention to claim Compensation for deterioration of holding (Section 14).

To .... (Tenant).
of ....

With reference to the holding known as .... and situate at .... which you now hold of me as my tenant I hereby notify you that it is my intention to claim from you under the Agricultural Holdings Act, 1941, compensation for the deterioration of the holding due to your failure to cultivate the holding according to the rules of good husbandry/or the terms of the contract of tenancy.*

*Delete words not required.

Dated this .... day of .... 19 .

Signed ....

(Landlord).

FORM 8.

AGRICULTURAL HOLDINGS ACT, 1941.

Notice to pay rent or remedy breach of term or condition of tenancy (Section 15(1) (b)).

To .... (Tenant).
of ....

With reference to the holding known as .... and situate at .... which you now hold of me as my tenant, I hereby require you to pay to me rent now due in respect of the holding, namely £.................. */or to remedy a breach, being a breach which is capable of being remedied, of the following term or condition of the tenancy consistent with good husbandry, namely (here set out term or condition).

If you fail to comply with this notice within a reasonable time, I propose to give to you notice to quit the holding by reason of such failure.

*Delete words not required.

Dated this .... day of .... 19 .

Signed ....

(Landlord).

FORM 9.

AGRICULTURAL HOLDINGS ACT, 1941.

Demand for arbitration as to rent. (Section 15(1) (e) & (3)).

To .... (Landlord or Tenant).
of ....

With reference to the holding known as .... and situate at .... which I (you) now hold of you (me) as your (my) tenant/landlord I hereby demand in pursuance of Section fifteen of the Agricultural Holdings Act, 1941, that the question as to the rent to be paid for the said holding as from the .... next at which date the tenancy could be terminated by notice given by me at this date be referred to arbitration under the said Act.

Dated this .... day of .... 19 .

Signed ....

(Landlord or Tenant).

FORM 10.

AGRICULTURAL HOLDINGS ACT, 1941.

Demand for Execution of Tenancy Agreement (Section 15(1) (f)).

To .... (Tenant)
of ....

With reference to the holding known as .... and situate at .... which you now hold of me as tenant, I hereby require you to execute at my expense an agreement setting out the existing terms of the tenancy.

If you fail to comply with this demand within a reasonable time, I propose to give to you notice to quit the holding by reason of such failure.

Dated this .... day of .... 19 .

Signed ....

(Landlord).

FORM 11.

AGRICULTURAL HOLDINGS ACT, 1941.

Demand for arbitration as to whether tenant is cultivating holding according to the Rules of Good Husbandry. (Section 15(2)).

To .... (Tenant)
of ....

With reference to the holding known as...... ...... and situate at .... which you now hold of me as my tenant I hereby demand in pursuance of Section 15 (2) of the Agricultural Holdings Act, 1941, that the question as to whether you are cultivating the said holding according to the rules of good husbandry shall be referred to arbitration under the said Act.

Dated this .... day of .... 19 .

Signed ....

(Landlord).

FORM 12.

AGRICULTURAL HOLDINGS ACT, 1941.

Notice of Intention to claim for Compensation for Disturbance. (Section 15(7)).

To .... (Landlord)
of ....

With reference to the holding known as .... and situate at .... which I now hold of you as your tenant, I hereby notify you that I intend to claim compensation for disturbance under Section 15 of the said Act.

Dated this .... day of .... 19 .

Signed ....
(Tenant).

FORM 13.

AGRICULTURAL HOLDINGS ACT, 1941.

Notice of particulars of claim to Compensation. (Section 17 (2)).

To .... (Landlord or Tenant)
of ....

With reference to the holding known as .... and situate at .... which I (you) now hold of you (me) as your (my) tenant/landlord I hereby give to you particulars of my claim(s) for compensation under the Agricultural Holdings Act, 1941, as follows:—

(Here set out particulars of claim(s).)

Dated this .... day of .... 19 .

Signed ....
(Landlord or Tenant).

FORM 14.

AGRICULTURAL HOLDINGS ACT, 1941.

Notice of Intention to remove fixture or building. (Section 21 (d)).

To .... (Landlord)
of ....

With reference to the holding known as .... and situate at .... which I now hold (or formerly held) of you as your tenant, I hereby notify you that after the expiration of one month from the date this notice is given it is my intention to remove the fixture(s) or building(s) described in the Schedule hereto which was (were) affixed or erected by me to or on the said holding.

Schedule.

Dated this .... day of .... 19 .

Signed ....
(Tenant).

FORM 15.

AGRICULTURAL HOLDINGS ACT, 1941.

Notice of election to purchase fixture or building. (Section 21 (e)).

To .... (Tenant)
of ....

With reference to the notice dated the .... given by you to me notifying me of your intention to remove from the holding known as .... and situate at .... which you hold (or formerly held) of me as my tenant the fixture(s) or building(s) comprised in the said notice, I hereby notify you that I elect to purchase such fixture(s) and building(s) as are described in the Schedule hereunder.

Schedule.

Dated this .... day of .... 19 .

Signed ....
(Landlord).

FORM 16.

AGRICULTURAL HOLDINGS ACT, 1941.

Notice of acceptance of notice to quit part of holding as notice to quit entire holding. (Section 25).

To .... (Landlord)
of ....

With reference to the holding known as .... and situate at .... which I now hold of you as your tenant, I hereby notify you that I accept the notice dated the .... to quit the part of the said holding described in the said notice as a notice to quit the entire holding to take effect at the expiration of the current year of tenancy.

Dated this .... day of .... 19 .

Signed ....
(Tenant).

Stripping Out of Cows.

Is it Necessary, and Does it Pay?

J. W. G. SMITH, Dairy Instructor.

QUITE a lot has been published recently regarding the "stripping out" of cows. It has been said, for instance, that cows, if not stripped out, may be, or are, more liable to disease than when stripped out—and again, that one must strip out to obtain greater returns. The subject has caused quite a lot of controversy in Australia, and in other parts of the world.

One of the statements made is that if a cow is not stripped out, the milk left behind in the udder may bring about disease, such as mammitis. Such a statement is not founded on fact, and must now be put aside.

It is obvious that if a cow is not stripped out, the milk that remains in the udder does not go bad. How often does the farmer, after persevering with a newly-calved heifer, say "She will let her milk down tomorrow." I suppose dozens of farmers have said that. Do these heifers contract mammitis? No. Again, how often has a farmer missed a cow in the paddock, or forgotten to milk one in the yard—or even not stripped out a cow, or the whole herd, just because he is in a hurry to get away or do some urgent job? Most farmers also have one "tough" cow in the herd, one that they are not too particular about stripping out.

These instances and many others can be given to show that farmers do not always strip the last milk from the cows, and that the cows have not, is consequence, been affected with any udder complaints.

It is not natural for a cow, in her wild state, to be milked out dry. Nature has provided the cow with the ability to hold back her milk, so that the calf does not take all the milk at once, especially in large quantities. The cow must, therefore, have milk left in her udder.

Then one might ask the question: "How many dairyfarmers milk their herds only once a day in the winter time when production is low, or in bad seasons?" Again, when the dairyfarmer wants a cow to "dry off," he leaves milk in her udder for days at a time without any bad effect—nothing happens to the cow and she does not contract any disease. These facts provide further evidence, if it is necessary, that it is foolish to claim that it is harmful to leave milk in a cow's udder, especially the little bit of strippings.

The claim of loss in production by not stripping out is also found to be at variance with the facts when given a moment's consideration. For instance, say a farmer milks forty cows twice a day, using machines, and he strips every cow out. How much milk will he receive from the strippings if he knows how to use the machines? Very little, probably about one quart. What a lot of wasted time and energy to obtain one quart of milk! The strippings are, admittedly, very rich in butter-fat, but the amount obtained and the time taken to get it is not worth the trouble. If this rich stripping is left in the cow, will it not be obtained at the next milking? Give these strippings, this quart of milk at each milking, a butter-fat test of 6.8 per cent. This will yield 124 lb. of butter-fat a year, which is approximately 145 lb. of commercial butter, which, at say 1s. 2d. per lb., would return £8 9s. 2d. for the year. If it takes just one minute to strip out each cow, 486 hours of labour are required per year at stripping, to obtain the abovementioned sum. In figures, 4d. per day is obtained by this stripping out. If stripping were cut out, labour would be saved and bustling would be avoided.

Is the stripping out of cows, therefore, worth while? Think it over.

Keep on Buying War Savings Certificates.

Forage Poisoning or Botulism.

GRAHAME EDGAR, B.V.Sc., Senior Veterinary Research Officer.

THE condition known as forage poisoning or botulism is a peculiar disease which affects, most commonly, horses, cattle, sheep and fowls. Man and other species of animals and birds are susceptible, but the disease is rarely seen in pigs, dogs and cats. It is caused by eating foodstuffs which have become contaminated with the poison or toxin of a particular micro-organism known as *Clostridium botulinum.* The disease is neither infectious nor contagious, and is not transmitted from one animal to another. As in the case of mineral and plant poisons, only the individuals or animals who have partaken of the poisoned foodstuff become affected.

How the Disease is Recognised.

The horse is the animal most commonly affected, whilst outbreaks in cattle, sheep and poultry occur in that order of frequency. The first indication of ill-health is a general appearance of depression and dullness. If the animal can be persuaded to walk the gait is slow and very stiff. The disease has acquired the popular name of "sleepy staggers," which is descriptive of the condition manifested by the affected animal.

The head is extended and lowered, there is some salivation and mucoid discharge from the nostrils. The tongue frequently protrudes from the mouth, particularly in cattle, and a stalk of hay or grass may hang from the corner of the mouth. Mastication is possible but extremely slow and after it has been chewed the food drops from the mouth. Although salivation is fairly profuse, swallowing is either very difficult or impossible. Attempts to make the animal swallow will reveal that the tongue is paralysed. Although presenting a most dejected appearance there are no indications that the animal is suffering any pain.

The paralysis of the tongue extends to the muscles of the throat, and usually in a few hours the animal loses co-ordination of the limbs and goes down. Ineffective struggles to regain its feet then ensue, and these are followed by a series of spasms of paddling with both fore and hind limbs.

Constipation is always evident and the temperature is usually below normal and is rarely much above normal. The pulse is rapid, but respiration is slower.

Death may occur in from 7 hours to 4 days depending on the amount of toxin or poison absorbed by the animal. The death rate in this disease is extremely high, but a few cases recover after a somewhat prolonged convalescence.

In birds the symptoms are very different from those seen in horses and cattle. The affected birds may remain on the perch, but usually they are found on the ground or lying on the nest with the body extended, and the neck flexed at an acute angle, with the beak supporting the head. The bird is completely paralysed and the peculiar effect of the paralysis on the neck of the bird, making it impossible for the bird to raise its head, has given use to the term "limber neck." Affected birds may die in from 48 to 96 hours after the onset of symptoms. Occasional cases recover, but such birds manifest considerable uncertainty in pecking their food for some time.

Post-mortem Appearances.

The post-mortem examination of an animal or bird dead from botulism reveals remarkably little in the way of outstanding changes. Frequently there is some slight congestion in the small gut, and occasionally in the larger bowel. At times some congestion of the lungs is encountered which can be attributed to the animal lying on its side for some hours before death.

How the Organism Occurs.

Clostridium botulinum, the botulism germ, exerts its disease-producing property in an indirect manner. This organism is one of the types of many bacteria which are found in soil, some of which are capable of giving rise to disease.

Fortunately for the human and animal populations of Australia ***Cl. botulinum*** is not a common inhabitant of soil of this country. The examination of several hundred soil samples from different districts of New

South Wales has shown its presence in only 9 per cent. of the soils examined. This can be regarded with some degree of satisfaction, especially when similar examinations of soils in countries of the Northern Hemisphere have shown a much higher incidence; in one country the organism was detected in 37 per cent. of the soils examined.

Cl. botulinum exists in the soil as a spore. To enable it to grow, certain conditions are necessary. While it is in the spore or resting state it may be swallowed by animals or man without giving rise to any evidence of ill health. One of the essential requirements for the growth of the organism is the absence or restriction of available air in the environment of the organism.

Association With Silage and Hay.

Outbreaks of forage poisoning or botulism in most cases are associated with the feeding of stock on conserved fodder—generally silage or hay. During the conservation of the fodder, particularly in pit silos, there is always the chance of odd botulinum spores being carried by the wind and dust into the silo. In the ordinary fermentation processes which occur following the closing of the silo, the changes which take place in the silage are most unfavourable to the germination of the spores and the subsequent growth of the organism; however, should conditions develop in the silage which favour the growth of other organisms, such as moulds, the requisite conditions are established for the growth of *Cl. botulinum.*

During its growth, this organism produces a very potent and deadly toxin, or poison, which permeates through the surrounding silage or hay. It is the toxin or poison in the foodstuffs which, when taken into the body by way of the mouth, gives rise to the characteristic condition termed botulism or forage poisoning. It is not the organism in its spore state which causes the disease but the poison it produces when growing in the foodstuff.

It should not necesarily be assumed that all mouldy fodder is dangerous. Mould growth always occurs along the first 2 or 3 inches at the sides of pit silo; such fodder should be discarded and not fed to stock.

In the case of hay, rain falling on an open stack or the development of very humid conditions during haymaking, are likely to cause spoilage of the hay by mould growth and the possible development of botulinum toxin in the hay.

As a general principle it may be said that the feeding of good wholesome silage or hay is not likely to prove harmful, whereas damaged mouldy silage or hay may be dangerous and hence should not be fed to stock.

At times haystacks become infested with mice and rats. In addition to soiling the hay with urine and faecal excreta, some die and the bodies putrefy in the hay. Such bodies may carry the botulinum organism which, with other organisms, propagates through the decomposing body of the rat or mouse and contaminates the surrounding hay with its deadly toxin or poison. It is for this reason that the hay at the bottom of the stack should not be fed to stock, as there is more chance of favourable conditions having existed in this part of the stack for the growth of *Cl. botulinum,* thus rendering this fodder poisonous or toxic for stock.

In the case of poultry and birds, infection is acquired from eating foodstuffs in which certain decomposition changes have taken place.

The Foodstuffs Involved.

In the examination of suspected foodstuffs associated with outbreaks of botulism in animals which have occurred over a number of years in New South Wales, a wide variety of animal fodders have been examined. These include silage prepared from wheat, oats, maize, sorghum and natural pasture, which in every outbreak investigated has been conserved in a pit silo where there is a greater chance of contamination with the spores of the organism than in a tower silo. Wheaten, oaten and grass hay have been incriminated in outbreaks, and on occasions wheaten and oaten chaff, especially in cases when the bags have become wet and conditions have become suitable for the growth of moulds. Outbreaks have also occurred following the feeding of mould-damaged grain.

Any decomposing animal or vegetable material may contain botulinum toxin, and this fact has been demonstrated by investigational work in America and Victoria in connection with losses from botulism in native birds and water fowl. These outbreaks are of interest in that the toxin developed in the subsiding water near the

shores of inland lakes which carried considerable amounts of disintegrating vegetable material. During heat waves in midsummer, the water near the shore became heated, and in conjunction with the decomposing vegetable material provided an adequate medium for the growth and toxin elaboration of the botulism organism.

Relationship Between Forage Poisoning and Carrion Poisoning.

The term "carrion poisoning" is used to describe a condition which is seen at times in cattle and sheep which eat carrion. This condition is actually botulism, that is, the affected animals manifest identical symptoms to those seen in cases following the eating of toxic fodder.

Although toxic fodders are, in almost every instance, damaged by mould growth, this seems to have little effect upon palatability, and they are usually readily eaten by animals. On the other hand, carrion is only eaten by animals in their search for certain food components which are inadequately supplied in the available grazing or fodders. The missing factors may be either protein or minerals. It has been known for many years that the soil in some districts is deficient in certain minerals and that cattle grazed in this country will chew bones. Then again, sheep during the drier summer months will eat rabbit carcases. This form of depraved appetite is evident during the summer months in certain districts of Western Australia, and it has also been recorded in New South Wales.

It should not be assumed that all carrion is capable of causing botulism, but the possibility always exists. Since the organism, *Clostridium botulinum* is found in soil, the possibility exists that the carcase of an animal or bird undergoing decomposition may be invaded by the botulism organism from the underlying soil. A decomposing carcase, even of a rabbit, is an excellent medium for the growth of *Cl. botulinum,* and the production of its toxin which permeates the carcase even to the bones. Consequently an animal eating parts of a carcase in which this has occurred will develope botulism, or as it is popularly termed, "carrion poisoning."

Treatment and Prevention.

Little can be done for an animal in the advanced stages of the disease and death is inevitable. In the early stages of the disease some investigators claim beneficial results from the administration of iodine and alcohol, the latter being known to have a neutralising effect upon the toxin.

Four types of *Cl. botulinum* have so far been recognised, known as types A, B. C and D, and although the toxins of the four types produce the same symptoms in animals, the poisonous components of the toxins are different. This has been shown by means of anti-toxin tests; that is, the anti-toxin of Type A will neutralise the toxin of Type A, but not of Types B, C or D, and similarly the anti-toxin of Type B will neutralise the toxin of Type B, but not of Types A, C or D and so on. Thus, when botulism occurs on an extensive scale, as for instance amongst sheep, during summer months in certain districts of Western Australia as a result of carrion eating, the determination of the type of *Cl. botulinum* has been responsible for reducing losses considerably. The sheep are vaccinated with a vaccine prepared from the particular type of *Cl. botulinum* infecting the carrion, prior to the seasonal occurrence of carrion eating and botulism.

Unfortunately preventive measures on the scale mentioned above are not always possible due to ignorance as to the particular type of *Cl. botulinum* responsible. It should be remembered that the vaccine is a preventive, and not claimed to have curative properties.

Finally, it should be remembered that there is a risk in feeding stock, particularly horses, on mould-damaged fodder, especially silage from pits, and such fodder must be regarded with suspicion. There is, of course, little risk in the feeding of sound wholesome silage.

Part of Hawkesbury College Apiary. The New Honey House is on the Left.

Beekeeping Hints.

W. A. GOODACRE, Senior Apiary Instructor.

Dwindling Troubles

May Cause Heavy Mortality.

THE term "dwindling" is used to describe conditions associated with the mortality which occurs amongst adult bees, arising principally from disorders of the digestive system. The trouble may, or may not, be associated with a specific organism, but it is mainly attributable to circumstances connected with, or conditions affecting, the food supply. Colonies working under unfavourable circumstances, such as may exist during a winter flow, are likely to suffer more heavily than others, because, owing to their lowered vitality they are unable to withstand sickness. The loss of production of honey and beeswax from "dwindling" is considered to be heavier than that arising from all other diseases combined.

A study of the various factors from which "dwindling" may arise, makes it possible, in many instances, to adopt measures which may prevent development of the trouble, or at least guard against a serious weakening of colony strength.

Losses from Pollen Compaction.

As an example, take an instance in which losses occur from compaction of pollen in the digestive organs of the bees. This is most likely to occur during spring when an abundant supply of pollen is available from the fields, and at the same time, the colony conserves its store of honey. Under these conditions the nurse-bees, particularly, in an endeavour to provide large quantities of brood food, consume a greater proportion of the readily available pollen than is required to make up a well-balanced diet. As a result, the digestive organs become congested with masses of dry, nitrogenous food,

setting up a severe form of compaction, or constipation.

This trouble is most likely to occur when colonies are short of honey stores needed for extension or maintenance of brood-rearing. These conditions may arise during the spring of this year following the adverse conditions for storage work during the past autumn. The best preventive measure, which may also be used as a remedy to afford relief should symptoms of the trouble have developed, is to practise stimulative feeding, preferably with sugar syrup. This

Giving a Small Colony a Frame of Honey.
A guarantee for spring progress.

will induce the bees to use a more favourable proportion of liquid food, which will soften the compacted pollen food and secure its subsequent elimination through the digestive tract.

As with all forms of "dwindling," it is difficult under these circumstances to make a sure field diagnosis of the cause of the trouble. If numbers of sick bees are found crawling about the front of the hive, and dead ones pile up near the hive entrance. some indication of compaction may be observed if pressure be applied on the sides of the abdomen of a sick bee and a mass of undigested pollen expelled.

Mortality Caused by Deteriorated Food Supply.

One of the most serious problems which the migratory bee-farmer has to face, is the avoidance of "dwindling" troubles during or following the working of a winter honey-flow. It is not profitable to secure an extraction or two of honey, and then be faced with heavy losses because adequate steps to maintain the health of the bees were not taken.

Recently it was observed that certain colonies were holding their own well on a winter flow until a change in the weather brought very damp and cold conditions extending over two weeks. Loss of bees through "dwindling" then became evident. In this instance dysentery was a prominent symptom, and was undoubtedly caused by the colonies having to deal with a deteriorated food-supply, and the bees being forced, owing to damp weather preventing necessary cleansing flights, to retain their faecal matter for a prolonged period. Just prior to the wet weather, the bees had a store of unsealed honey in the hive, and they were unable to complete the processing work. In consequence, some yeast-development occurred, and the health of the bees was affected in dealing with it under such trying conditions.

The bee-farmer could not forecast the damp weather, of course, but, with the knowledge of the effect likely to arise under such circumstances, he could have arranged, on the first appearance of the "dwindling," to move his apiary temporarily to a new site away from the honey-flow where the bees would have a better chance to make a rapid recovery, thus minimising the risk of serious loss in colony strength.

Working Winter Flows on Unsuitable Country.

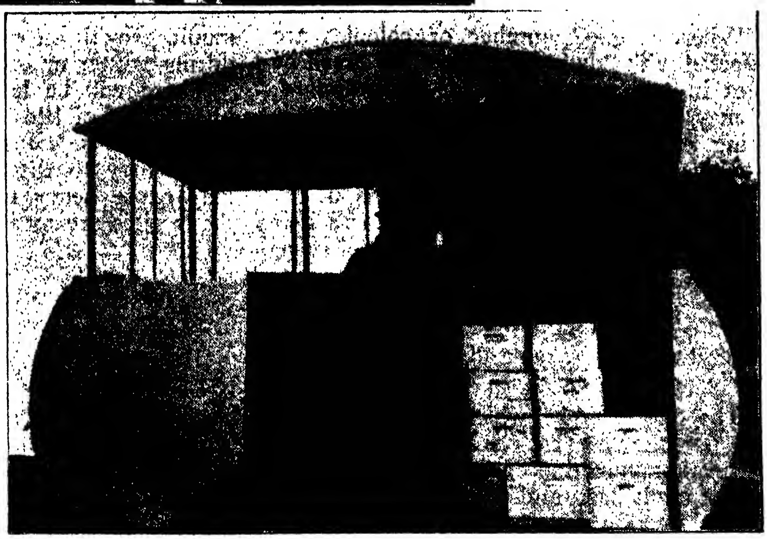
The selection of country for the working of winter honey-flows to reduce losses through "dwindling" has been given more attention of late years, and it is obvious that country where climatic conditions border on the extreme during winter, should be avoided for this purpose. There is a limit to the severity of the winter conditions during which the bees are able to maintain a reasonable amount of brood and withstand the heavy strain imposed on the field-force. On this account we find that a good deal of handy country, on which both Mugga and White Box are well distributed,

is assiduously avoided by experienced migratory men. In some cases this experience has been bought at rather heavy cost in bee life. Much of the hilly country between Molong and Parkes, for instance, is well-established with mature Mugga Ironbark trees, yet we find Molong bee-farmers moving out to the distant Dubbo-Peak Hill side to work a flow from the same species. They know from experience the danger of operating in country where the winter is severe.

The same applies to other districts where winter conditions are somewhat on the extreme side, and where the honey flow may be from White Box or Yellow Box. In this type of country the bees may not show actual symptoms of sickness, but the field bees die off as a result of hard work under extremely difficult conditions, while the colonies are incapable of producing sufficient young bees for replacements from the brood-nest. Where such country is worked, examination during the early spring will usually reveal that the hives are full of honey, but contain only a handful of bees with a low vitality—and the prospect of the colonies making a recovery is almost hopeless. As there were not many dead bees about the hives, nor any symptoms of sickness, the bee-farmer inexperienced in the working of this country is prone to assume that some strange "disappearing disease" has decimated the colonies.

A Portable Honey House on a Trailer.

Used by Mr. H. Goodwin, of Gunnedah, who is shown (on the left) with his assistants. The equipment includes power extractors and steam-heated cappings reducer and knife.



The Plant in Operation with the Roof in the Raised Position.

The sides are of wire gauze to exclude bees, and the supers are passed in through the door (shown open) in the back of the trailer.

Shortage of Pollen May Cause Severe Dwindling.

Shortage of pollen during a winter flow, or even during a flow from Yellow Box in the warmer months, is one of the most common factors leading to "dwindling" troubles. Winter-flowering ironbarks, and our famous honey tree, the Yellow Box, are very poor sources of pollen, and during dry times when other plants fail to produce this necessary nitrogenous food, the vitality of the bees is affected, and they become likely subjects for stomach trouble; even young bees raised from the brood at this time may have little stamina and consequently be short-lived. It appears likely that some of the difficulties in this direction may be overcome in the near future by feeding a suitable substitute pollen food to which reference is made later in these notes. However, until such times as we are able to establish a suitable substitute food, it will be necessary to ensure that the colonies are not kept over-long on a flow where natural pollen is scarce and there is evidence of harmful effect on brood-rearing.

Inherent Weakness of the Strain May Cause Losses.

Where a good number of colonies are affected with "dwindling," and the breed of bees in the apiary is of a fair standard, it may be assumed that some difficulty is being encountered with the food supply, whereas persistent individual cases are often the result of an inherent weakness in the strain of bees. In the latter instances it is not uncommon to find the protozoan parasite, *Nosema apis*, associated with the outbreak. There are cases, of course, where the strain of bees in the apiary has so degenerated that Nosema disease has become fairly general.

The only way by which the presence of the parasite can be determined in microscopical examination of the alimentary tract of the adult bees, and where it is suspected that *Nosema apis* is present, it is advisable to forward a couple of dozen fresh speciment of affected bees to the Department for examination. The package should have a few small holes punched in it to allow escape of gases and prevent mould growth

The best form of treatment is to practise stimulative feeding to raise the vitality of the bees, and as soon as possible arrange to tone up the standard of the strain by the introduction of young Italian queens which have been raised from a virile strain.

"Spring Sickness" in Bees.

Severe forms of "dwindling" may also arise during spring when reasonable care has not been exercised to ensure that the bees have been provided with comfortable quarters during the cold winter months. and where large hives have been employed for wintering, so that the stores in the supers could not be given proper attention. These stores are liable to absorb moisture and become a ready source for yeast development (fermentation), and are a common cause of "spring sickness" when the bees make an effort to repair the damage. Removal and extraction of the deteriorated honey supply is helpful, and it should be heated to 150 degrees Fahr. before being fed back to the colonies. It is advisable also to wash the combs before returning them to the hives, and the extractor should be sterilised with boiling water.

Damp Sites are Dangerous.

To guard the health of bees the apiary should be located on a sunny, well-drained and sheltered site; such conditions prevent mould growth on combs outside the cluster during winter or early spring.

There will be less risk also, on a well placed site, of bees becoming infected with *Bacillus apisepticus,* an organism which finds entry to the blood of the bees and may cause heavy mortality; bees kept on damp sites are most susceptible.

Pollen Substitutes.

Under the above heading Messrs. M. H. Haydak and M. C. Tanquary of the University of Minnesota, U.S.A., have submitted the following report:—

"The results of the experiments showed that cottonseed meal or soybean flour, mixed with dry skim milk not only can be favourably compared with bee bread, but, in the case of soybean flour, the pollen substitute actually gave better results. It has also been found that on both of these pollen substitutes the bees can rear queens which do not differ externally from those produced in the bee bread-fed colonies.

"Therefore, soybean flour, produced by the expeller method or that from which the fat has been extracted with a solvent

(*Continued on page* 396)

Whole Wheat Compared with Gristed Wheat as a Food for Pigs.

W. L. Hindmarsh, Director of Veterinary Research, and
A. F. Gray, Chief Piggery Instructor.

THERE is conflict of opinion as to whether grain should be crushed or otherwise prepared, when used for pig feeding. Some consider that whilst there may be more rapid growth in pigs fed ground grain, the increased price so obtained does not compensate for the added cost and labour. Most authorities agree that there is an advantage in crushing or grinding the harder grains, but all do not agree on the advisability of preparing wheat in this way.

To obtain information on the matter a feeding experiment was carried out at the Glenfield Veterinary Research Station. In this trial the nett increased return per pig fed on gristed wheat was from 7s. 9d. to 8s. 11d. greater (dependent on the cost of gristing) than from pigs fed whole wheat.

For this trial two litters, each of six Berkshire pigs, were obtained from Grafton Experiment Farm. The litters were born within four days of each other, the older being eleven weeks of age when the experiment started. The pigs were divided into two groups so that (*a*) three pigs from each litter were included in each group; (*b*) three barrows and three sows were included in each group; (*c*) the mean weights of the pigs in each group were approximately equal. The allocation of the groups to the respective feeding methods was decided by chance. One group was fed whole wheat and the other ground wheat.

The Method of Feeding.

The method of feeding adopted was that recommended by the Department of Agriculture, which is as follows:—

Commencing at eight weeks of age, pigs receive 1¼ lb. of grain each per day. Each week the amount of wheat given to each pig is increased by ¼ or ½ lb. per day until at the twenty-fourth week the pigs are each receiving 6 lb. of wheat daily. At the end of the twenty-fourth week the pigs should be ready for sale as baconers. In addition to the wheat, each pig receives ¼ lb. of meat meal and 2 lb. of greenstuff (increasing to 3 lb. per day according to appetite) per day. It is advisable to allow the pigs have access to earthen yards and to provide lime (carbonate of lime or bone flour).

In this experiment the pigs were kept in concrete pens as no yards were available. Mineral was supplied as mixed bone and wood ash. The wheat and wheat meal were from the same supply, the grain being ground as required. In both cases the grain was soaked overnight in just sufficient lime water to permit of complete absorption of the fluid. The amounts of food fed daily were identical.

The Weight Gains.

Although the pigs were selected from two litters and representatives of each litter were distributed evenly in the two groups, there was considerable variation in the initial weights, as is shown by the following:—

	Range.	Mean.
Group A (gristed wheat) ...	39 to 52 lb.	43.5 lb.
Group B (whole wheat) ...	34 to 53 lb.	42.5 lb.

In group A (gristed wheat) the final mean weight at twenty-six weeks was 185 lb., and in group B, 169 lb.. the gains in weight during the fifteen weeks feeding being 141.5 lb. and 126.5 lb. respectively. Expressed as percentages the weight gain of group A was 325 per cent. and group B 297 per cent., a difference of 28 per cent.

The Cost.

To obtain this gain in weight the average amount of food eaten per pig was approximately—

Wheat	7 bushels
Meat meal	26 lb.
Greenstuff	210 lb.

The pigs were consigned to a bacon factory which arranged for the slaughtering and weighing of the carcases.

The cost of the pigs, their feeding and transport to factory was as follows:—

	Gristed Wheat Group.			Whole Wheat Group.		
	£	s.	d.	£	s.	d.
Six pigs at £1 each... ...	6	0	0	6	0	0
Freight—Grafton to Glenfield	1	16	8	1	16	8
Wheat (43 bus.)	8	16	7½	8	5	4½
Freight on wheat	0	12	2	0	8	2
Meal meal (157 lb.) ...	2	15	0	2	15	0
Freight on meat meal ...	0	2	5	0	2	5
Greenstuff (1,260 lb.) ...	0	5	0	0	5	0
Transport of pigs to factory	0	17	6	0	17	6
	£21	5	4½	20	10	1½

Live Weights, Dressed Weights and Prices.

The live weights, dressed weights and prices received will be found in the following table:—

Pig No	Initial Weight in lb.	Final Weight in lb.	Dressed Weight in lb.	Price per lb.	Value of Carcase.		
			Gristed Wheat.				
					£	s.	d.
414	39	188	128*	9½	5	1	4
419	43	184	156	9	5	17	0
415	52	201	140	9½	5	10	10
420	40	151	117	9½	4	12	7½
422	37	189	142	9½	5	12	5
416	50	184	150	9	5	12	6
Total	261	1,111	833	...	32	6	8½
Mean	43.5	185	138.8	...	5	7	9
			Whole Wheat.				
421	41	155	118	9½	4	13	5
423	34	175	132	9½	5	4	6
417	53	203	160	9	6	0	0
425	43	164	125	9½	4	18	11½
424	40	155	119	9½	4	4	8½
418	44	160	112*	9	4	4	0
Total	255	1,012	766	...	29	15	7
Mean	42.5	169	127.6	...	4	19	3

* Head condemned, not included in weights.

It will be noted that two pigs of each group were too fat for bacon requirements, and the price per lb. was 9d. in these instances as compared with 9½d. for the other pigs. In each group one head was condemned. The gristed wheat fed group had a mean value per carcase of £5 7s. 9d. and those fed whole wheat £4 19s. 3d., the difference being 8s. 6d.

The returns from the groups were as follows:—

	Gristed Wheat.			Whole Wheat.		
	£	s.	d.	£	s.	d.
Total return from group ...	32	6	8½	29	15	7
Cost of pigs and food ...	21	5	4½	20	10	1½
Nett return	11	1	4	9	5	5½
Difference between groups (Total)	1	15	10½			
Difference between groups (average per pig) ...	0	7	9¼			

In this estimation the cost of gristing the wheat is taken as the difference in the prices of wheat meal and of whole grain delivered at Glenfield. This is approximately 4d. per bushel. The cost of gristing wheat in farming centres is usually 3d. per bushel, whilst the cost of gristing on the farm is probably about 2d. per bushel. Thus, if the wheat is gristed off the farm, the difference in return per pig in favour of those fed gristed wheat would be 8s. 4¼d., and if the farmer ground the wheat himself 8s. 11¼d.

Wastage of Whole Wheat.

It is claimed by some that one advantage of grinding wheat is that pigs utilise all that is eaten, whereas a proportion of whole wheat passes through the digestive system unmasticated, and is passed out with the excreta (sometimes to be again eaten).

To obtain information on this point the whole of the droppings for twenty-four hours were collected on two occasions, and the wheat carefully separated. This proved to be a tedious task, because the grain was entangled in the fibrous residue of greenstuff which the pigs had eaten. From six pigs, aged about twelve weeks, receiving between them 12 lb. of wheat per day, 5½ ounces of dry grain was recovered from the droppings collected in twenty-four hours. Much of the grain was shrivelled, apparently because some of the soluble contents had passed out. This represents only 1/36th of the amount fed, and such a loss may be regarded as negligible.

At a later stage when the pigs were about twenty weeks old and were receiving 5 lb. of wheat each per day, 1¼ lb. of wheat was recovered from the droppings passed in twenty-four hours by three pigs. This represents 1/12th of the amount fed.

(*Continued on page* 395.)

FEEDS and FEEDING NOTES.

. . . . . . **Contributed by** . . . . . .
The Division of Animal Industry.

THE LIMESTONE QUESTION.

Many inquiries as to the value of ground limestone for stock continue to be received, and it is thought advisable to answer in these notes some of the commoner questions concerning this material.

Is Ground Limestone a Substitute for Salt?

The answer is "No." Ground limestone and salt are of totally different chemical composition. *Ground limestone* is composed of calcium, carbon and oxygen; *salt* of sodium and chlorine. As salt (sodium and chlorine) is sometimes required in feed for poultry, pigs, dairy cattle being hand-fed, and for working horses, limestone cannot, under any circumstances, be regarded as a substitute for salt.

Can Ground Limestone be used as a Substitute for Bone Meal, Bone Flour or Dicalcic Phosphate?

Again the answer is "No." These latter products, contain calcium, phosphorus and oxygen, and, as limestone contains no phosphorus, it cannot be regarded as a substitute. Bone meal, bone flour or dicalcic phosphate are indicated for cattle on phosphorus-deficient areas which are not top-dressed with superphosphate, and are used in some chicken feed mixtures. They are probably of little value for horses or pigs unless the animals are grazing on phosphorus-deficient country. There is a good deal of experimental evidence indicating that, even where sheep are grazing on extremely phosphorus-deficient country, there is no value in providing phosphorus supplements.

Under What Circumstances Might Ground Limestone be of Value to Sheep?

Ground limestone only increases the calcium content of the diet, and, if the diet is already adequate in calcium, no benefit can be expected to result from its use. There is no evidence, as yet, that sheep on pasture suffer from calcium deficiencies, so that there is no indication for its general use for pasture-fed sheep.

However, recent research has shown that, if sheep are maintained for some length of time on cereal products such as hay and grain, calcium deficiency may then limit growth and lead to various disorders of growth, so that, 1 per cent. of ground limestone (1 lb. to 100 lb. of feed) can be added to the feed, or a lick of equal parts of salt and ground limestone can be given.

Where sheep are being mainly fed on cereal grains, and it is desired to give a lick of ground limestone and salt, a permit for purchase of salt may be granted under the Stock Food and Remedies Order of the National Security Regulations. However, if the sheep are only to be maintained for a short while on such feed, there will probably not be much value in giving the limestone.

Is Ground Limestone of Value to Any Other Stock?

Pigs fed mainly on cereal products, as wheat, with meat meal or boiled offal, and no dairy by-products, and only a little green feed, frequently suffer from calcium deficiency, and 1 per cent. of ground limestone in the feed is then a valuable addition to the diet.

Dairy cattle being heavily fed on grains and meal with only little hay or chaff, may also possibly suffer from a calcium deficiency as grains and meals are usually rich in phosphorus and poor in calcium, so that 1 oz. of ground limestone per day in the feed may be a wise precaution under these conditions.

Supplies of Ground Limestone and Bone Meals.

Ground limestone is at present in short supply so that it should onlv be used under those conditions where it might conceivably

be necessary, *i.e.*, for drought-fed sheep and pigs, and cattle on a possibly calcium deficient ration.

Dicalcic phosphate is at present unobtainable, but fair supplies of bone meal and bone flour are available, and these are nearly of equal value to dicalcic phosphate as sources of phosphorus. To conserve supplies of phosphorus supplements, they should only be used where they are necessary, *i.e.*, for cattle grazing on phosphorus-deficient areas, for some poultry mixtures, and, in some exceptional circumstances, for horses and pigs.

Economy in the Use of Meat Meal.

UNDER the Feeding Meals (Restriction of Sales) Order issued under the National Security (Agricultural Aids) Regulations, no person is allowed to purchase more than 7 lb. of feeding meal in any one month, unless a permit for a greater amount has been granted. "Feeding meals" for the purpose of this Order refers to meat meal, meat and bone meal, blood meal, blood bone and offal used for feeding purposes, and any mixture containing these meals. Bone meal is *not* rationed.

A temporary control scheme is at present operating whereby all stockowners requiring more than 7 lb. of feeding meal per month must make application to the Chief, Division of Animal Industry, Department of Agriculture, Box 36A, G.P.O., Sydney, stating their name, address, type and numbers of stock to be fed, name and amount of material required, period over which the amount should last, and storekeeper or agent from whom it is intended to purchase the material. If the application is approved, a permit will be forwarded to the applicant

In the near future (and this may be before this *Gazette* is distributed) it is intended to introduce a scheme whereby under certain circumstances, supplies may be available on application to storekeepers or agents.

The Value of Meat Meal.

The property of meat meal which makes it such a valuable supplement to other feeds, especially for pigs and poultry, is its high content of protein of animal origin. However, and this is important, if more meat meal is supplied than is required, the protein is not used as protein, but is simply used as a source of fat or energy, *i.e.*, the meat meal, which is comparatively expensive when compared with grain meals, will be used for a purpose for which the cheaper grain meals should be used. Thus, it is wasteful, both financially and physiologically, to feed excessive meat meal.

Poultry.

In mashes containing a good proportion of bran and pollard, 6 per cent. of meat meal containing between 50 and 60 per cent. of crude protein is sufficient, but, where wheat meal comprises the greater part of the mash, up to 8 per cent. should be used. Where meat and bone meal, which contains between 40 and 45 per cent. crude protein, is used, these percentages may be increased to 7½ and 10 per cent.

Pigs.

Where ¾ gallon or more of butter milk or skim milk per head is available, it does not pay to use meat meal. Approximately ¾ gallon of skim or butter milk is equivalent as a source of protein, to ½ lb. of meat meal of 50 to 60 per cent. protein content. Even where such dairy by-products are not available, the quantity of meat meal and other feed, such as grain, required to produce a baconer or porker, may be considerably reduced by grazing pigs on such protein-rich feed as young fodder crops, good pasture, or, best of all, lucerne. However, where no dairy by-products or such grazing are available, meat meal can be used in the following methods with grain:—

(*a*) ¼ to 1-3 lb. of meat meal per day from weaning to marketing;
(*b*) 6 per cent. from weaning to marketing;
(*c*) Decreasing percentages of meat meal may be used as pigs mature: 10 per cent. being used in the first month after weaning; 7½ per cent. in the second; 5 per cent. in the third, and 2½ per cent. in the fourth.

During the last few weeks of finishing, meat meal can probably be dropped altogether from the ration without ill-effect.

Cattle.

Meat meal can be used for cattle, but, on account of the peculiar nature of the cow's digestive system, other protein-rich feeds which often cannot be used for other stock, should be used as a source of protein in preference to meat meal. Lucerne grazing or hay, young fodder crops, young pasture and the oil meals, such as linseed meal, peanut meal and coconut meal, are excellent sources of protein for dairy cattle. Meat meal should not be used except when these feeds are not available.

However, where only starchy foods, such as sorghum, maize or cane are available, meat meal may then be used in small amounts, such as ½ to 1½ lb. per day, but trouble may be experienced in introducing cattle to the feed as it may at first not be very palatable.

Sheep.

Feeding meals are of value for sheep at times during drought, but, under present circumstances, large supplies for feeding are unlikely to be available.

Where sheep and dairy cattle owners consider that there is no other feed available which would suit their purpose, an application may be made for supplies of feeding meals, and, taking into account the state of supplies, consideration will then be given to the application.

Current Feeding Costs.

Feed.	Starch Unit Value per 100 lb.	Protein Unit Value per 100 lb.	Cost.	Cost per Starch Unit.	Cost per Protein Unit.	Remarks.
ROUGHAGES.						
Lucerne hay or chaff ...	35–45 (Av. quality 40).	10	£7 10s. to £9 10s. long ton.	2·2d.–2·8d.	...	Lucerne the best buying among roughages. Protein content justifies a higher price than the other roughages.
Oaten chaff	40	3	£8 long ton	2·4d.	...	
Wheaten chaff ...	40	3	£8 long ton	2·4d.	...	
Oaten hay	33	3	£6 10s.–£8 long ton ...	2·4d.–3d.	...	
Wheaten hay	33	3				
STARCHY CONCENTRATES.						
Wheat	72	8	3s. 3¾d. per bushel in truck lots—3s. 6¾d. bagged.	·9d.–1·1d.	...	Wheat still the cheapest starchy food.
Wheatmeal	72	8	£7 5s. per short ton ...	1·2d.	...	
Maize	78	8	7s. bushel	1·9d.	...	Maize too expensive for feed purposes.
Maize meal	78	8	£14 per short ton ...	2·1d.	...	
Barley	71	7	3s. bushel	1d.	...	Barley practically as cheap as wheat.
Barley meal	71	7	£7 5s. short ton ...	1·2d.	...	
Oats	62	8	3s. bushel	1·5d.	...	Oats not a cheap feed at present.
Crushed oats	62	8	3s. 8d. per 40-lb. ...	1·8d.	...	
Pollard	66	10	£6 short ton, F.O.R. ...	1·1d.	...	Pollard good buying.
Bran	56	10	£6 short ton, F.O.R. ...	1·3d.	...	....
PROTEIN CONCENTRATES.						
Linseed meal	72	25	£10 per short ton ...	1·7d.	5d.	Fair supplies.
Peanut meal	78	43	£6 10s. short ton, ex store.	1·1d.	1·8d.	Supplies very short.
Cocoanut meal ...	76	15	£7 per short ton, F.O.R.	1·1d.	5·1d.	Supplies limited.
Meat meal	80	55	£10 10s. short ton ...	1·6d.	2·4d.	Supplies moderate.
Maize gluten	78	20	£9 short ton	1·4d.	5·4d.	Supplies very short.

MINERAL SUPPLEMENTS.

Mineral.	*Cost.*	*Supplies.*
Ground calcium carbonate (limestone)—a calcium supplement.	34s. per ton in bags, (truck lots).	Available in four months.
Bone meal (a calcium and phosphorus supplement)...	£14 10s. per ton, F.O.R.	Supplies moderate.
Bone flour (a calcium and phosphorus supplement)...	£11 15s. per ton, F.O.R.	Supplies available.
Shell grit	30s. per ton (bulk) ...	Supplies available.

You Cannot Lose if You Keep on Buying War Savings Certificates.

RICKETS IN CHICKENS.

Particular Care Needed This Season.

T. G. HUNGERFORD, B.V.Sc., H.D.A., Veterinary Officer.

POULTRY farmers will need to give close attention to the prevention of deficiency diseases this season — particularly of rickets, the cause of which is a deficiency of Vitamin D.

There are two sources from which poultry, including chickens, can build up their supply of Vitamin D — their own bodies when exposed to direct sunlight (not through glass), and cod liver oil supplied as food. Under normal conditions ½ to 1 per cent. of a reliable cod liver oil in the mash will supply ample for the growing chickens.

Where chickens are raised in battery brooders they are not usually exposed to direct sunlight, and in consequence the Vitamin D may be in short supply. At present, cod liver oil is practically unobtainable and many other oil supplements are off the market. A number of unhappy experiences have come under notice recently in which owners have fed a material alleged to be cod liver oil, but which did not prevent rickets. The fact is that many oils which are quite rich in Vitamin A are very poor in Vitamin D. When purchasing supplements a guarantee of the vitamin content should be sought. A satisfactory oil to prevent rickets should contain 100 international units of Vitamin D (chick tested) per gram of the oil.

If such an oil is not obtainable, sunlight must be depended on to provide Vitamin D.

When chicks hatch, the yolk passes into the abdominal cavity and is absorbed during the first week of life. Thus, if the parent fowl was not deficient in Vitamin D (had free range in the open), the chicken will probably have sufficient reserves of Vitamin D in the yolk and in its body to carry it over the first three weeks of life. It is, therefore, an advantage, from the standpoint of rickets and other diseases, to get battery-hatched chickens on to the ground, and with access to sunlight, by the time they are three weeks of age. It is, of course, necessary to provide warmth for the chickens.

If this is done, and the chickens are placed on relatively clean ground, they will pick up mild infestations of Coccidia and worm eggs, which allows them to develop a certain amount of resistance to these troubles. If kept in the battery until five or six weeks old, they are soft, have no resistance to the diseases mentioned and frequently heavy mortalities occur.

The symptoms of rickets are a wobbly, staggering gait, distortion of the beak (this is a more advanced stage) and enlargement of the joints. A mass mortality may occur if early symptoms are not noted, and the deficiency is not rectified.

A deficiency of calcium and phosphorus in the diet or a lack of balance between these will make extra supply of Vitamin D necessary. With these two points in mind, as much calcium as the chickens will take should be supplied in the form of shell grit. The phosphorus will be supplied in the bone meal, but in the normal rations used in the State, no more than 3 per cent. should be fed. Excess bone meal will provoke outbreaks of perosis due to its effect in rendering the trace element manganese non-assimilable.

To avoid a deficiency of Vitamin A, fresh green feed should be supplied to chickens from the time they are a week old. It is very important that this fresh green feed should not have been manured with poultry dung within the last three months, as in this case worm eggs may easily be brought to the chickens, producing a heavy worm infestation.

THE compost heap is a cheap and efficient way of converting garden and household plant refuse into valuable fertilising material. Lawn clippings, vegetable tops, leaf mould, weeds prior to seeding, and crop residues free from disease are very suitable items for composting, but the coarse, woody stalks of plants should not be included.

AUSTRALIAN WHEAT BOARD

Wheat for Stock Feeders in Wheat Areas

Some uncertainty appears to prevail as to methods available for the purchase of Wheat in Wheat-growing areas from the Australian Wheat Board for Stock and Poultry Feeding.

Wheat may be purchased by any Stock or Poultry Feeder direct from the Board in single bag lots from any station where a stack is open for railing.

The Buyer should first ascertain whether a stack at the station from which he requires delivery, is open for railing. He should then write to the State Superintendent, Australian Wheat Board, 16-18 O'Connell Street, Sydney, stating:

(i) The quantity of Wheat required;

(ii) The station from which he wishes to take delivery; and

(iii) Enclose pro forma payment at 10/9 per bag.

An authority to deliver will then be issued by the State Superintendent and when the Wheat is delivered and weights ascertained, any excess amount due to the Buyer from his pro forma payment of 10/9 per bag will be remitted to him.

Present price for Bagged Wheat is 3/6$\frac{3}{4}$ per bushel, Sydney basis, less rail freight from delivery station to Darling Harbour.

Occasionally **"pick-ups"** from stack and ground are available at reduced prices. "Pick-up" Wheat may only be sold on the authority of the Board's Inspector and at prices determined by him. When such authority has been given, Buyers may purchase from the local Agent at the price fixed, but delivery will only be given of such "pick-ups" after the whole of the rest of the Wheat has been trucked out and payment will be required before delivery.

BULK WHEAT—Bulk Wheat may be purchased in similar manner in lots of not less than 100 bushels. Delivery can only be given from Silos when an Officer of the Government Grain Elevators Department is at the Elevator to give delivery. The price basis is 3d. per bushel less than that for Bagged Wheat and pro forma payment required is 3/- per bushel. Any bags, twine or labour required for taking delivery of the Wheat to be supplied by Buyers at their cost.

C. J. PERRETT, Secretary,
Australian Wheat Board.

6th July, 1943.

POULTRY NOTES.

August, 1943.

Substitutes for Bran and Pollard.

E. HADLINGTON, Poultry Expert.

THE continued shortage of pollard and bran makes it necessary to use substitutes in the morning mash, and many inquiries are being received by the Department concerning suitable alternatives. Unfortunately there are no commodities cheaper than pollard and bran which might take their place. Thus it is advisable for poultry farmers to secure as much of these mill offals as possible to use with wheatmeal or other substitutes.

The Use of Wheatmeal.

As far as pollard is concerned, wheatmeal is practically the only readily available alternative, but the cost is a good deal greater. However, provided that some bran or cocoanut meal is available, a suitable mash can be made by using wheatmeal in place of pollard, and experiments at Hawkesbury Agricultural College have shown that birds fed on 50 to 60 per cent. of wheatmeal in conjunction with bran and meatmeal, give results equal to those fed on the ordinary ration. In using wheatmeal it is, of course, necessary to increase the percentage of meatmeal to balance the ration, because of the higher carbohydrate content of wheatmeal compared with pollard.

There are various types of wheatmeal available, some being of a granular nature, while others are flaky in texture. The main consideration when using wheatmeal for a wet mash, is to ensure that the mixture is not too sticky, nor on the other hand too granular, which would be the case if a high percentage of coarse wheatmeal were used.

One advantage in using wheatmeal as a substitute for pollard is that there appears to be little disturbance in production when a change is made from one to the other. Thus the quantity used can be regulated according to the available supplies of pollard.

Soaked Wheat.

As an alternative to wheatmeal. soaked wheat can be fed to the birds either in the morning only (with dry wheat in the afternoon), or both morning and afternoon. If from 10 to 20 per cent. of either pollard, bran, or wheatmeal is mixed with the soaked wheat, and about one-third by measure of chaffed green feed, it will be found more palatable to the birds. In feeding soaked wheat (with the meals mentioned) for the morning feed only, it is necessary to add about 12 per cent. of meatmeal, the weight being based upon the dry weight of wheat and the meals only, and if fed twice per day, one-half the quantity of meatmeal would be required at each feeding.

The following are suggested mixtures for morning mash to be fed in conjunction with dry wheat or wheat and maize in the afternoon. They are merely suggestions, and variations can be made to suit individual requirements or other items which might be available can be added provided that the alterations are made with products which have similar amounts of protein and carbohydrate, or the proportion of the protein concentrate is varied to maintain a "balanced" ration.

Suggested Mixtures for Morning Mash.

Fine wheatmeal	35 lb.
Pollard	30 lb.
Bran	17½ lb.
Cocoanut meal	10 lb.
Meatmeal	7½ lb.
	100 lb.
Salt for a wet mash	22 oz.
Salt for a dry mash	16 oz.

Fine wheatmeal	35 lb.
Pollard	15 lb.
Maizemeal	7½ lb.
Bran	15 lb.
Cocoanut meal	10 lb.
Finely chaffed green feed	10 lb.
Meatmeal	7½ lb.
	100 lb.
Salt for a wet mash	22 oz.
Salt for a dry mash	16 oz.

Fine wheatmeal	40 lb.
Pollard	10 lb.
Oaten pollard, extra wheatmeal, or maizemeal	15 lb.
Bran	15 lb.
Finely chaffed green feed	12 lb.
Meatmeal	8 lb.
	100 lb.
Salt for a wet mash	22 oz.
Salt for a dry mash	16 oz.

Fine wheatmeal	50 lb.
Pollard	10 lb.
Bran	10 lb.
Cocoanut meal or bran	10 lb.
Lucerne meal or fine lucerne chaff or chaffed green feed	12 lb.
Meatmeal	8 lb.
	100 lb.
Salt for a wet mash	22 oz.
Salt for a dry mash	16 oz.

Fine wheatmeal	60 lb.
Lucerne meal or fine lucerne chaff	11 lb.
Cocoanut meal	10 lb.
Chaffed green feed	10 lb.
Meatmeal	9 lb.
	100 lb.
Salt for a wet mash	22 oz.
Salt for a dry mash	16 oz.

Feather Picking and Cannabilism.

FEATHER picking is a vice which is observed on many farms, but very often the condition is not noticed by the owner until it has reached an advanced state. In some instances the trouble is mistaken for moulting, but to the experienced there is no mistaking the characteristic stripped and broken feathers, and, in severe cases bare red patches, particularly around the tail and abdomen.

The picking might start around the neck, but the most commonly affected part is the abdomen, and when this part is denuded of feathers it is not uncommon for cases of cannibalism to occur. These birds are known as "pickouts," but should not be confused with "pickouts" due to prolapsis or protrusion of the oviduct.

When cannibalism follows upon feather picking it is due to the bare vent being picked by the other birds. When blood is drawn, the victim is set upon and soon succumbs to the onslaught by being eviscerated.

Feather picking and cannibalism occur mostly on farms where the birds are kept under intensive conditions or in small, bare yards, and these vices are seldom encountered where good range is provided. However, there are some instances in which it is difficult to account for the troubles, but usually one or more factors might be responsible.

Probable Causes.

In an attempt to arrive at the cause of feather eating, it is often necessary to take into consideration the conditions during the early stages of rearing, as the vice frequently commences at a very early period, and follows through to the adult stage, becoming more pronounced as the birds reach the end of the flush laying period. In other instances, the trouble may start only after the pullets come on to lay.

Some of the items to which consideration should be given when an outbreak occurs are: Insufficient salt in the ration; too close confinement, especially when no scratching litter is provided; overcrowding; small bare yards; perches too close or too low; nests too exposed to the light; feeding a ration not properly balanced or lacking in protein supplements; continued shortage of green feed; lack of suitable shell grit; and the absence of gravel for grinding purposes, particularly in the case of birds kept intensively.

Salt.—As far as salt is concerned, numbers of cases have come under notice where an outbreak of cannibalism among chickens has been overcome by increasing the quantity of salt in the ration to about 1½ per cent. in each feed.

Dry Mash Feeding.—Similarly, if there is a shortage of salt in the food of the older birds, feather eating may be induced. This is one of the reasons why the trouble is more pronounced among birds fed on dry mash, as it is not safe to use the same quantity of salt in a dry mash as where the mash is fed wet.

Another way in which the feeding of dry mash tends to cause feather picking, is the fact that the birds have of necessity to congregate around the hoppers for the greater part of the time to obtain their requirements, and when constantly clustered together they are likely to acquire the habit of picking at each other's feathers.

The same tendency is noted where birds are closely confined or overcrowded, especially if they are not kept busy by providing plenty of scratching litter and feeding them in it.

Perches Too Close and Too Low.—The trouble is often experienced where the perches are close

enough to permit of the birds picking those opposite while sitting on the roosts; or if too low, the same thing occurs from the floor. Feather picking is also more common where the runs are at the back, instead of the front, of the houses, as the birds remain inside during windy weather, and so the mischief spreads.

Conditions conducive to feather picking are provided where the nests are too exposed to the light, especially if they are not deep enough, or if an alighting board is placed in such a position that the birds, by standing on the board, can pick those in the nests.

It sometimes occurs that a few birds are responsible for an outbreak of feather picking, due to the fact that while remaining inactive in the houses they set an example which the others follow.

Remove the Probable Cause.

In summing the matter up, it will be found that in most instances where feather picking is prevalent, there exist at least some of the conditions outlined, and the only course is to remove any of the probable causes, but it must be realised that when the trouble has progressed to such an extent that many of the birds are showing bare patches on the body, it cannot be expected that there will be any immediate improvement. Moreover, the appearance of the birds will not be altered until they get a new coat of feathers, which will be in the moulting season.

It is significant that where the birds have good large runs, are not crowded in the houses, and are fed a simple, balanced ration, together with a reasonable supply of green feed, cannibalism and feather picking are seldom experienced. Thus, these troubles can be largely attributed to errors in management, environment and feeding.

Flock of Langshans and White Leghorns showing Results of Feather Picking in an Advanced Stage.

Whole Wheat Compared with Gristed Wheat—*continued from page* 388.

These two observations support those of other observers who have recorded that young pigs masticate whole grain more efficiently than older pigs.

Summary.

Two comparable groups each of six pigs about eleven weeks old were fed in the same manner on wheat, meat meal and greenstuff, except that in one instance the wheat was fed whole and in the other the wheat was ground to a coarse meal. The pigs were slaughtered on the same day, when they were twenty-six weeks of age.

The pigs fed gristed wheat increased from 43½ lb. to 185 lb. mean weight, a gain of 141½ lb. Those fed whole wheat increased from 42½ lb. to 169 lb. mean weight, a gain of 126½ lb. The difference between the mean dressed weights was 11.2 lb. The mean values of the carcases were: Gristed wheat group £5 7s. 9d., whole wheat £4 19s. 3d. The mean nett increased return of the gristed wheat group over the whole wheat group was between 7s. 9¼d. and 8s. 11¼d., dependent on the cost of gristing.

Two estimations of the amount of whole wheat excreted in the faeces of the whole wheat fed pigs suggest that the loss so sustained is negligible in the young pigs, but is of some significance as the animals approach bacon weights.

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
		1943.
W. J. Frizelle, Rosenstein Dairy, Inverell ...	76	1 Aug.
Wollongbar Experiment Farm... ...	112	4 "
A. E. Liggins, "St. Leger Dairy," Kuring-gai Chase Road, Turramurra North	52	7 "
W. Budden, "Hunter View," Kayuga Road, Muswellbrook	18	7 "
Kahlua Pastoral Co., "Kahlua," Coolac ...	314	10 "
T. McLane, Wellingrove, Inverell	33	10 "
W. Willis, "Rosedale," Inverell	17	13 "
E. L. Killen, "Pine Park," Mumbil	252	23 "
A. Hannaford, Braidwood	20	26 "
W. S. Grant, Braidwood	20	26 "
J. McKenzie, Inverell	35	28 "
Farrer Memorial Agricultural High School, Nemingha	39	29 "
The William Thompson Masonic School, Baulkham Hills	50	29 "
Lunacy Department, Rydalmere Mental Hospital	65	30 "
Berry Training Farm, Berry	162	31 "
Navua Ltd., Grose Wold, via Richmond (Jerseys)	118	4 Sept.
Australian Missionary College, Cooranbong ...	113	8 "
Department of Education, Gosford Farm Home	40	29 "
A. L. Logue, "Thornbro," Muswellbrook ...	46	13 Oct
Woomargama Estate	207	22 "
W. J. Stephenson, "Hill View," Fig Tree ...	57	1 Nov.
Barnardo Farm School, Mowbray Park ...	75	4 "
State Penitentiary, Long Bay	10	9 Dec.
		1944.
Limond Bros., Morisset	60	13 Jan.
J. M. Turnbull, "Pastime," Kayuga Road, Muswellbrook	75	15 "
E. R. Fishlock, Fig Tree, Wollongong ...	38	18 "
St. Ignatius College, Riverview	25	27 "
Department of Education, Yanco Agricultural High School	69	6 Feb.
Riverina Welfare Farm, Yanco	74	6 "
St. John's College, Armidale	30	8 "
A. C. O'Dea, Perry Street, Dundas	28	14 "
McGarvie Smith Animal Health Farm, Liverpool	55	22 "
C. Wilton, Bligh Street, Muswellbrook ...	75	3 Mar.
N. L. Forster, Abington, Armidale (Aberdeen Angus)	188	12 "
Forster and Sons, Abington, Armidale (Jerseys)	87	13 "
Lunacy Department, Morisset Mental Hospital	84	15 "
Wagga Experiment Farm (Jerseys)	81	20 "
Trangie Experiment Farm, Trangie	121	20 "
New England University College, Armidale ...	12	31 "
St. Michael's Orphanage, Baulkham Hills ...	18	31 "
W. H. Long, Brodie's Plains, Inverell ...	44	13 April.
A. G. Wilson, "Blytheswood," Exeter ...	62	14 "
		1944.
H. F. Bradley, "Nardoo," Ashford Road, Inverell	35	15 April.
Grafton Experiment Farm	191	15 "
Lunacy Department, Callan Park Mental Hospital	26	1 May.
T. J. Wilks, "Oaks Farm," Muswellbrook ...	37	5 June.
E. J. Cottell "Kapunda," Rob Roy, Inverell	50	23 "
L. W. Campbell, "Dunmallard," Fern Hill Road, Inverell	32	23 "
E. D. Rankins, "Oakwood," Inverell ...	23	23 "
J. O. McGufficke, "Lovely Bank," Rob Roy, Inverell	20	23 "
J. H. Lott, "Bellevue," Rob Roy, Inverell ...	23	23 "
Cowra Experiment Farm	66	24 "
New England Experiment Farm, Glen Innes (Jerseys)	73	27 "
G. T. Reid, "Narrengullen," Yass	274	3 July.
Farm Home for Boys, Mittagong	49	9 "
St. Vincent's Boys' Home, Westmead ...	26	20 "
Lidcombe State Hospital and Home	106	30 "
Hurlstone Agricultural High School, Glenfield	37	31 "
Ebsman Bros., Inverell	28	13 Aug.
Peel River Land and Mineral Co., Tamworth (Beef Shorthorns)	82	28 "
Fairbridge Farm School, Molong	92	31 "
Bathurst Experiment Farm	24	9 Oct.
Lunacy Department, Gladesville Mental Hospital	34	23 Nov.
Hawkesbury Agricultural College, Richmond (Jerseys)	110	18 Dec.
		1945.
The Sydney Church of England Grammar School, Moss Vale	51	5 Feb.
Koyong School, Moss Vale	2	8 "
New England Girls' Grammar School, Armidale	30	11 "
W. W. Martin, "Narooma," Urana Road, Wagga	143	22 "
R. C. Dixon, Elwatan, Castle Hill (Jerseys) ...	31	29 Mar.
Lunacy Department, Parramatta Mental Hospital	66	30 "
A. E. Stace, Taylor Street, Armidale	38	1 April.
A. D. Frater, King's Plain Road, Inverell ...	123	12 "
F. C. Harcombe, Hillcrest Farm, Warialda Road, Inverell	38	13 "
Parker Bros., Hampton Court Dairy, Inverell	180	17 "
H. F. White, Bald Blair, Guyra (Aberdeen Angus)	186	30 "
Emu Plains Prison Farm	108	7 May.
Sir F. H. Stewart, Dundas	12	5 June.
S. E. E. Cohen, Auburn Vale Road, Inverell...	33	22 "
B. N. Coote, Auburn Vale Road, Inverell ...	79	22 "
A. N. De Fraine, Reservoir Hill, Inverell ...	28	22 "

Tubercle-free Areas.

The following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis :—

Bombala Area.
Inverell Area.
Braidwood Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

MAX HENRY, Chief of Division of Animal Industry.

Beekeeping Hints—*continued from page 386.*

and the flour heated afterwards, can be recommended as food for bees. The flour should have 5 to 7 per cent. of fat. In offering the pollen substitute to the bees, four parts of the flour should be mixed with one part of dry skim milk by weight."

The production of soybeans in Australia is being given particular attention, and there are companies which extract oil from them, but we may have difficulty until after the war in securing flour reduced to 5 to 7 per cent. of fat as required for bee-feed.

The Agricultural Gazette.

September, 1943.

EDITORIAL——

Labour for Food Production.

RECENT announcements by Federal and State authorities leave little room for doubt that adequate labour for the primary industries will be made available this coming season. Steps are also being taken to ensure that suitable accommodation for this additional labour—an equally important war-created problem in farming areas—is provided.

It still remains, however, for producers, or groups of producers, to assess their requirements sufficiently far in advance to give the authorities charged with the supply of both labour and accommodation, sufficient time in which to act. In past seasons a disinclination on the part of farmers to assess their requirements well in advance has been at the root of most of our labour problems. Early reliable estimates, to be modified or confirmed as the season progresses, is all that is necessary at this stage.

In making this survey—either on a crop or seasonal basis—primary producers will have the ready assistance of district and local War Agricultural Committees. These committees have already been advised that the job of assisting farmers to assess their labour needs is to be regarded as their most pressing task. It is important that these estimates should be based on the capacity of a district to step-up production of essential foodstuffs to the level of the nation's requirements. There has been a tendency in some areas to produce to the capacity of the remaining facilities on the farm rather than to the productive capacity of the farm. This is contrary to the nation's interest.

OUR COVER.

WOMEN are playing their part in supplying farm labour. Our cover of an Australian Women's Land Army Girl is from a Sun-News Pictorial photograph.

In short, this season's labour problem is largely in the hands of farmers. There is every promise that all reasonable requirements will be met. It is to be understood, of course, that before requesting labour every endeavour should be made by primary producers and War Agricultural Committees, working in closest collaboration with National Service Officers, to fulfil requirements from local sources—by farmer co-operation, by the transference of labour from farm to farm as the harvesting of different crops proceeds, and by the utilisation of town labour pools, local women's auxiliaries and similar sources of labour.

Cattle Tick Found at Stanthorpe, Queensland.

New South Wales Authorities Perturbed.

TICK control authorities are perturbed regarding the threat of introduction of cattle tick to portions of New South Wales just over the border from Stanthorpe, Queensland. It would be a disaster if the tick gained entrance to further areas in New South Wales.

At a recent meeting of the Cattle Tick Commission, the New South Wales' representative expressed anxiety regarding the situation created by the finding of cattle tick at Stanthorpe. This country is normally tick free, and its close proximity to the border of New South Wales has necessitated the imposition of further restrictions on the entry of stock from that portion of the northern State.

The influx of Queensland cattle during the last year or so has been very heavy, and, in view of the Stanthorpe infestation, considerable additional responsibilities will now be thrown on to officers along the Queensland border.

Occasionally comments are made to the effect that cattle ticks are so unlikely to spread during the winter months that restrictions should be eased, but it is erroneous to think that the tick is entirely dormant during that period. Notwithstanding the severity of the winter in northern New South Wales and southern Queensland, infestations have been found, and some of them very heavy, in every month of the winter period. It is consequently not safe to rely in any way on frosts and cold such as are experienced in the portions of the States mentioned.

The eradication campaign in the Grafton-Maclean area is proceeding, but naturally the work has been made difficult by the dry conditions experienced. Nevertheless it has been necessary to continue with the campaign, as otherwise all the work so far carried out might well be wasted. Fortunately it has been found possible to utilise some of the leased country in the Grafton-Maclean area whereon stockowners have been accustomed to wintering their stock.

The necessary inspections of stock following dipping in the Grafton-Maclean area will be commenced next month, and will be carried through until the Department of Agriculture is in a position to say that the situation is safe enough to allow the removal of restrictions on that area. Only a prolonged period of inspection can be considered of value.

Germination of Stored Onion Seed.

THE results of onion seed tests for germination during two years of storage were published in the *Agricultural Gazette* of August, 1942. The variety was Early Improved White Hunter River and the seed was stored both in bags and in sealed bottles, under room conditions of temperature and humidity, and in a refrigerator at 40-50 degrees Fahr. Germination after harvest was 93 per cent.

The samples have now been stored for three years, and tests made at quarterly intervals have enabled the following conclusions to be made:—

For commercial purposes it may be said that—

1. If good quality onion seed has to be kept from one season to the next, it makes little difference whether it is stored in open or air-tight containers, either under "natural" or refrigerated conditions. A high percentage of germination will be maintained for about one year.

2. After that time, however, deterioration begins, and not only is the germinating capacity affected, but also the germinating energy.

3. In "natural" storage—

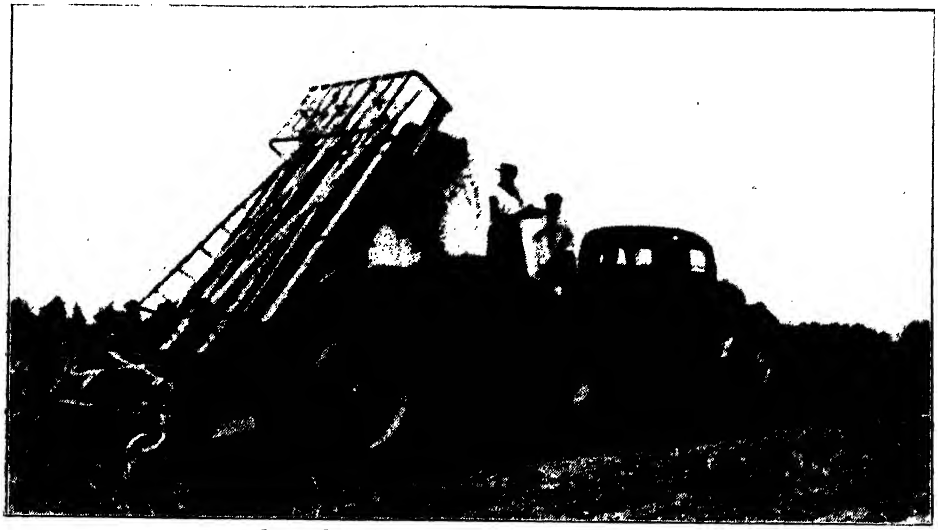
(*a*) Bagged seed will germinate above standard (50 per cent.) even after fifteen months, but from a practical point of view, the seed by then is of little value.

(*b*) The germinating energy of sealed seed begins to slow down after about fifteen months. After two years the germinating capacity has dropped to a little above standard, and the vitality of the seed is so reduced that it seems that about eighteen months is the maximum storage period.

4. In the cold store—

(*a*) The germination of bagged seed is still above standard even after three years if it is sown immediately after removal from the refrigerator. Two and a half years, however, seem to mark the storage limit when seed is held in "natural" conditions for three months before sowing, as would happen in commercial practice.

(*b*) Sealed seed will also germinate reasonably well after three years' storage but only if sown within about a fortnight of being taken from the refrigerator. If held in "natural" conditions for three months before sowing, deterioration is rapid when seed is older than fifteen months.—AMY MYERS, Seeds Officer.



Green Crop Harvester Picking Up Green Peas.

GREEN PEAS FOR CANNING.

A New Industry Firmly Established.

JOHN DOUGLASS, H.D.A., H.D.D.

THE green pea canning industry, instituted as a wartime venture in Australia, has already reached a stage which will ensure permanency after the war. The Commonwealth Government has imported a number of pea vining machines and sufficient agricultural implements and pea seed of suitable canning varieties to guarantee establishment of the industry on sound and efficient lines.

Provided the peas are canned successfully there is no reason why the canned article should not find favour with the housewife after the war—the fighting forces require practically the whole of the present output. Experience definitely indicates that canned green peas are superior to the home-cooked article.

The technique to be followed in the growing and harvesting of peas for canning, differs considerably from the standard method of growing for the fresh green pea market.

The methods to be followed in the growing of garden peas or green peas for market are well known and consists briefly of:—

(*a*) Standard soil preparation.

(*b*) Sowing of seed at the rate of 60 to 90 lb. per acre in rows spaced from 2 to 3 feet apart.

(*c*) Planting of standard varieties, of which Greenfeast is the most popular; these varieties produce heavy and persistent yields, which are ready for harvest over a period of several weeks.

(*d*) Inter-row cultivation, using a single-horse cultivator.

(*e*) Staking or trellising the peas in certain districts.

(*f*) Hand picking and marketing in bags or crates.

Cultural Methods.

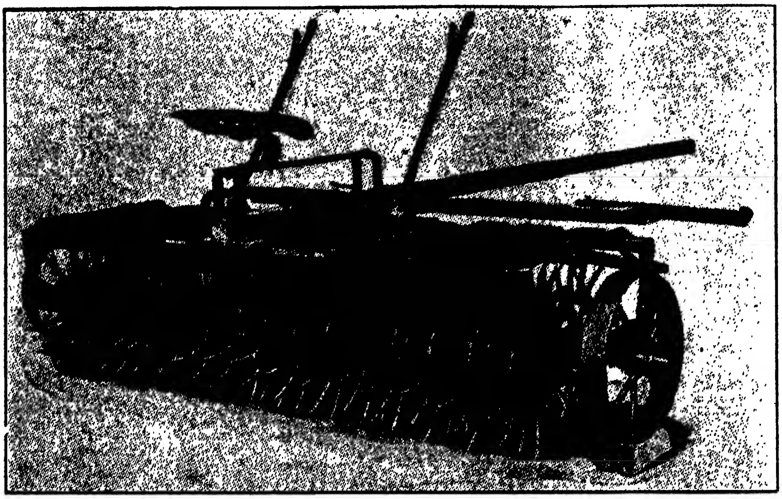
In the growing of canning peas, the chief object is to produce heavy crops of high quality peas at low prices. The whole of the operations must be mechanised in order to eliminate expensive labour, and at the same time to secure maximum yields of peas of the highest possible quality.

Soil Preparation.

The soil preparation for canning peas must be more thorough than for the green

pea market, first of all because it is necessary to ensure adequate yields which it will pay to harvest mechanically, and also because, to facilitate mechanical harvesting, it is necessary that the soil be reasonably level.

The Commonwealth Government is fostering the establishment of pea canning in Australia in order to meet Defence requirements, and is concerned with the difficulty of changing the standard Australian agricultural practice of growing peas in rows.



A Rotary Hoe with Two-horse Hitch.

Briefly, the soil should be ploughed as early as possible, 9 inches deep, if the subsoil will allow this depth of ploughing. Comparatively long fallow should be practised so that the soil may absorb rains and in order that subsequent weed growth may be destroyed. In most soils the finishing off process for canning peas should consist of a heavy harrowing followed by the use of a Meaker harrow. This harrow is an American invention and consists of a series of small discs followed by a bevelled levelling board, behind which are very fine discs. The effect of this harrow is to prepare an exceptionally fine seed bed with a level surface.

Seed Sowing.

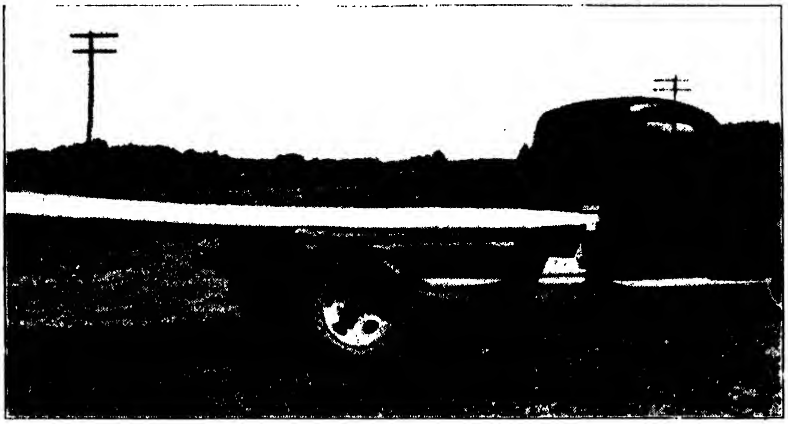
In all countries of the world where peas are to be mechanically harvested they are grown "broadcast." Broadcasting consists of sowing the seed through a special seed drill, which is constructed on similar lines to a wheat drill, except that the enlarged cups enable the peas to be sown at the rate of up to 300 lb. per acre. Wheat drills will not usually allow sowing of more than 90 lb. per acre. The peas are sown through every row of the drill, and these are spaced 7 inches apart. To avoid fertiliser injury of the embryo plants the fertiliser is not sown with the drill.

It is thought that in many districts where the land is hilly, stoney or badly prepared, the broadcasting of the pea crop will not be a success. It has therefore been decided that for the present farmers should follow their usual practice of growing peas in spaced rows, except in favoured districts. It is also considered that if the rate of seeding could be increased to 90 lb. per acre much better results would be obtained.

A Navy Bean Harvesting Machine which will Cut Two Rows of Peas at a Time.

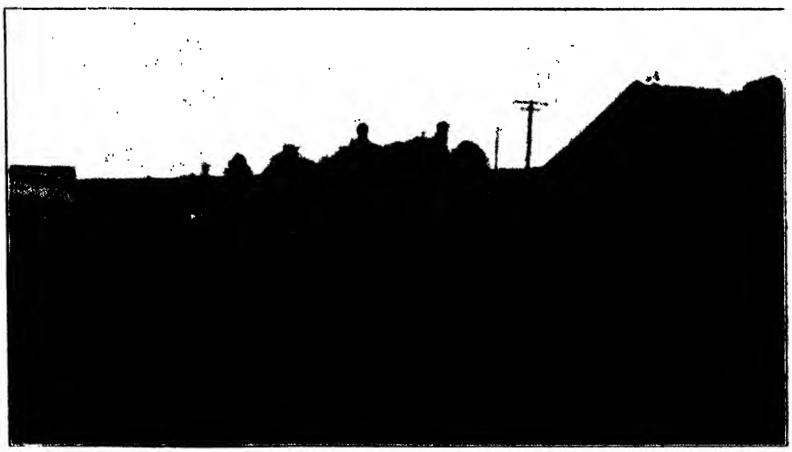
After-Cultivation.

Even if the soil for the crop has been thoroughly prepared and cultivated over a long fallow, conditions will occur when after-cultivation of the crop will be necessary. When heavy rain storms occur just prior to the crop showing above the ground, thus forming a crust on the soil, it is necessary to use a rotary hoe in order to break the crust and allow the small plants to grow. This rotary hoe consists of two rollers made of long round-ended teeth. These rollers go right over the crop, but do practically no damage to the plants.



Home-made Tipping Lorry for Carting Peas.

Long poles hinged at the sides and at the front of the platform are pointed into the ground wide of the truck, and when the vehicle is backed slightly the front of the platform is raised and the load tipped off.



A Load of Peas Tipped.

In this case the truck is fitted with a hoist.

Again after-cultivation is necessary when excessive weed growth occurs while the crop is still an inch or so in height. A machine called a weeder, which is somewhat like a hay rake having long, very flexible narrow tines, is used to destroy the weeds but not to interfere with the crop.

Harvesting.

The harvesting of a canning crop usually consists of four separate operations, viz., cutting, loading, hauling and unloading. In the case of a broadcast crop, the whole of the top growth of the plants is mown with an ordinary lucerne mower or special pea crop harvester with a suitable attachment for lifting the recumbent pea vines, enabling the blades of the mower to sever the whole of the plant at ground level. The mower, moving along, passes the cut crop on to a special attachment which places the peas in windrows. Under certain circumstances side delivery rakes are pulled behind ordinary mowers, thus delivering the crop into the windrows.

An American Pea Mower.

In America a machine has been perfected which is pushed in front of a tractor. This

machine is somewhat similar to the platform section of a reaper and binder, having beaters which lift the vines erect, allowing the efficient working of the knives. The cut crop then falls on to a canvas conveyor, which throws it clear of the machine into a well-defined windrow.

In Europe a somewhat similar machine is extensively used for peas, meadow hay and other crops. This machine consists of a mower with beaters which sweep the cut material on to a stationary platform. This platform, which is as wide as the total length of the cutter, is constructed in such a manner that the beaters push the material around the platform, which turns at right angles and delivers the material in a windrow at the side and to the rear of the machine.

Harvesting Row Crops.

In pea crops growing in wide rows, mowing equipment is not very satisfactory for many reasons, the chief of which is that the inter-row cultivation forms slight hills along the row of the plants, thus preventing the efficient working of the mowers. Navy bean harvesting machines, which have two long steel cutting blades, have proved very successful in cutting two rows of peas at a time and bringing them into a windrow. Certain of these Navy bean harvesting machines have a rake attachment at the back for cocking the crop as the machine is in operation.

The green crop loader, which is actually a heavy type of hay loader, is attached behind a motor lorry for loading the mown green peas on to the lorry. The green crop loader actually picks up the vines from the field, carries them up an elevator and throws them on to the platform of the lorry, where they are stacked by hand.

The transportation of the peas to a cannery or vining station should be very rapid, as the quality deteriorates through natural dehydration or by sweating. It has been ascertained that there is a great loss of sugar in peas immediately after harvesting, particularly during the first 3 hours.

Unloading.

In order to save hand labour, peas are usually transported in motor lorries with dumping bodies. These dumping bodies are not usually hydraulically worked, but are constructed on the farm. The body is hinged at the back, and a long pointed pole is hinged to the front of the platform at each side. On arriving at a vining station or a cannery, these long poles are set in the ground wide of the truck, which is then slowly backed so that the tipping body is raised, causing the load to slide off.

Vining.

The vining operation in green pea work is perhaps the most interesting of all phases. Viners are actually thrashers or poppers which remove the green, succulent peas from the pods while the latter are still on the vine. A pea viner working efficiently should not lose more than 2 per cent. of the peas during this operation.

A Vining Station.
The vines are forked into elevators, and the thrashed vines are loaded from high elevators on the other side into trucks to be taken away for stock feed.

Varieties.

Plant breeders have for twenty-five years been trying to breed the perfect pea—one which will mature the whole of its crop of high quality pods at one period. Actually, modern canning vining peas do mature 95 per cent. of their pods at the one period for harvesting. Experience in Australia has proved conclusively that such varieties as Early Wisconsin Sweet and Canner's

Perfection, will give excellent results as vining canning peas in this country.

It has been proved that if the operations of harvesting, vining and canning peas are carried out during a period of less than six hours, and if the canning is done satisfactorily, the resultant canned product is superior in every way to ordinary home-cooked green peas.

Disposal of Pea Vines.

The vines of the threshed peas are sometimes referred to in America as "pea straw," though the name is misleading since the material is very green and succulent. The vines are much sought after as stock feed, and in certain vegetable areas, where stock raising is not undertaken, the vines are used as green manure crop.

Although the pea vines are sometimes used fresh, they are usually turned into silage in stacks, and yield an excellent product. The estimated food value of pea vine silage is about one-third of that of lucerne hay. The spoilage from the making of pea vine silage is usually heavy compared with other crops, losses from 8 to 10 inches on the side of the stack, and often as deep as 20 inches on the top being a common experience.

Farmers deliver the pea crop to a vining station and are entitled to take away their vines free of cost, and to use them as they think fit. If the cannery authorities stack the pea vines or arrange for a contractor to stack them. In the winter time in to stack them, then the silage becomes the property of the cannery. In the winter time in America this pea vine silage is readily bought by local farmers, generally at the rate of 2-dollars per ton (short ton—2,000 lb.).

In many parts of America the pea vines are stall-fed to steers, and hence, to some extent, are responsible for the baby beef industry in America, and in other areas the vines are converted into pea straw.

Approved Seed—September, 1943.

To assist in the production and distribution of approved seed of recommended varieties of crops and vegetables, the Department publishes in this list each month the names and addresses of growers of such seed. For this service a charge of 2s. 6d. is made for each insertion of each variety listed. The number of varieties listed on behalf of each grower will be restricted to twenty-five for the time being. The Department may inspect the crop producing the seed, and in all cases a sample of the seed must be sent to the Department of Agriculture with information as to the location of its production, and must be accompanied by the fee indicated above.

If any seed producer does not wish to pay the advertising charge he may submit his name with the variety of seed and sample to the Department, and if it is approved his name will be listed in the Department and information will be supplied regarding it to inquirers.

Maize.—
- Fitzroy—Manager, Experiment Farm, Grafton (10s. per bus. f.o.r. Grafton).

Sorghum.—
- White African—Manager, Experiment Farm, Grafton (3d. per lb.).

Tomatoes—
- Red Marhio No. 95—Rumseys Seeds Pty. Ltd., 331 Church-street, Parramatta.
- Potentate—Rumseys Pty. Ltd., 331 Church-street, Parramatta.

Cauliflower—
- Shorts—H. Burton Bradley, Sherwood Farm, Moorland.

French Beans—
- Brown Beauty—Mr. H. P. Richards, "Sovereignton," Tenterfield.
- Granda—Mr. H. P. Richards, "Sovereignton," Tenterfield.

Garden Peas—
- Greenfeast—Mr. S. Lee Archer, "Ebenezer," Tumorrama, *via* Tumut.

Parsnip—
- Hollow Crown—Department of Agriculture, Sydney. (3s. per lb.).

Varieties of Approved Seed Available.

IN order that farmers may be directed to what are regarded by the Department as the most satisfactory local sources of approved seed of recommended commercial varieties of farm crops and vegetables, the Department is willing to supply information concerning such sources of seed of the following varieties:—

Maize.—
- Golden Superb, Golden Nugget, Golden Beauty and Leaming.

French Beans—
- Tweed Wonder, Wellington Wonder.

Pumpkins.—
- Queensland Blue.

Melon.—
- Hawkesbury Wilt-resistant.

Grasses, etc.—
- *Phalaris tuberosa,* Subterranean Clover (mid-season), Sheep's Burnet, Lucerne, Sudan.

Agricultural Manpower Problems.

Maintaining Balance Between the Production and Fighting Fronts.

K. G. CARN, Assistant Deputy Director-General of Manpower, N.S.W.*

THE control of manpower is a new experience for Australia, but it has quickly become a real necessity as the nation has become "geared up" for complete welfare. The Manpower Directorate was established to function as a tribunal in weighing up all demands for the available labour, in allocating that labour to planned organisation and in maintaining balance between production and the fighting forces.

While the secondary industries have had considerable experience in dealing with organised labour, the rural producers, who are "rugged individualists," found it most difficult to apply this type of control to their individual properties and problems. Farmers have not been accustomed to assessing their labour months ahead, and driving a hard bargain with other industries to have the necessary labour delivered to their farms on a definite date. In addition, the difficulty of ordering rural labour is most intimately bound up with seasonal peculiarities, which can, as all farmers well know, play havoc with the best of plans.

This position was met in Britain by the setting up of War Agricultural Committees, and the Government in Australia instituted a similar plan, which has been extended to all problems of rural production. Those committees really take the place of boards of directors—organising, assessing requirements, and placing bulk orders for a large number of small units.

During the early stages of the war the rural labour force volunteered freely for active service, and a large number drifted to the rapidly expanding secondary industries, where wages and conditions were most attractive. Japan entered the war in December, 1941, and with the fall of Malaya there was a very determined but cool action by all sections of the community to build up an army sufficiently strong to meet the emergency. During the next three months the manpower was stretched to the limit by accepting volunteers and heavy call-ups for the armed forces.

Control of Rural Labour.

In February, 1942, the Manpower Directorate was set up, and early in May, 1942, action was taken to retain a balance, and the call-up of bona-fide rural workers who were producing wheat, etc., was stopped, and while this action steadied the rapid movement, it was found insufficient as the drift was still taking place to secondary industries. Next step was taken in August, 1942, when Regulation 13 was applied to secondary industries. This regulation made it necessary for all employers to engage labour through a National Service Officer. Rural labour was thus prevented from escaping through this channel. The engagement of rural workers was excluded from this Regulation, which meant that this labour was free to move provided that it remained in primary production.

During the early part of 1943 the enlistment of rural workers was prevented, unless they qualified for acceptance as air crew for the R.A.A.F. Even the enlistment of lads through the Air Training Corps is affected by this ruling and where a boy does not qualify for air crew he is not allowed to pass to ground staff.

Employers' associations have recommended that a form of protection be given to some industries to prevent free movement within the "ring fence." This is not easily effected, for with the development of the war demands, the priorities of goods change, *e.g.*, wheat and wine are not now so urgently required, while vegetables, rice, butter and meat are at a premium. This change of production is not being done by closing down one area and building up another, but by a general building up of

* Notes of an address at the recent Agricultural Bureau State Conference.

production on a mixed farming basis to provide the necessary goals on a district basis.

The Basis is Minimum Requirements.

The actual labour requirements are now based on the very minimum necessary successfully to harvest, transport and process the food required, while general farm improvements are at a standstill and ordinary maintenance is not receiving usual attention. The labour force on this basis must be mobile, and move from district to district as crops mature. The mechanisation of rural industries has made it possible for producers to sow much larger areas than they can harvest with the same amount of labour. This labour is moved on a pattern system, with shearing as the broad base and major numbers; wheat requires a higher number for a short period and they generally move then to fruit, potatoes, wheat seeding, rice harvesting, sugar cane cutting, rabbiting, shearing, wheat, and fruit and so on. Any material upset of the numbers of any one industry reacts throughout the general pattern scheme.

A Survey of Available Rural Labour.

During the last twelve months considerable work has been carried out to survey, mobilise more efficiently and increase the available rural labour force. The foundation of this work is the building of occupational registers such as shearing labour, wheat handling labour, chaffcutter gangs, sugar cane cutters, rabbiters, drovers, butter factory skilled staffs, etc. These men are registered basically for this work, and while they remain in rural work throughout the year they are available for call to the registered work.

In addition, the force has been strengthened by building reserves of unskilled labourers. A force of young 18/19 year-old soldiers is available through the amendment of the Defence Act. These lads are available after doing 6 months training and where they are considered too young to be sent to operational stations.

All single men up to forty-five years of age still in rural industries are being surveyed with the idea of building up in each centre a skilled pool of rural labour which can be moved quickly to assist in emergencies of harvesting or associated rural probelms such as food processing. These men will be required to leave their farms during slack periods for a few weeks to assist in other areas in work of an urgent nature, and then return to their own farms. The District War Agricultural Committees are assisting Manpower in organising this labour, which, if successfully mobilised can mean a great deal towards the successful handling of the farmers' crops in future.

The possibilities of using prisoners of war are being fully exploited and prisoners are keen to work on properties without guards. A considerable number of prisoners have already been placed, and the results have been excellent.

Members of the Australian Women's Land Army are being Trained to do Many Farm Jobs Which Previously Were Considered Beyond Them.

The W.A.S.P.S.

All local labour both male and female is being organised on a local basis, and this is a considerable unit if fully explored. A move has commenced for the organisation of local girls as local auxiliaries to the Women's Land Army. In New South Wales this unit has called itself "WASPS" and it has great possibilities for providing emergency labour for short periods. The help of a labourer for even a day often makes a vast difference to ultimate goals, and provides producers with a feeling of confidence.

The A.W.L.A.

The Australian Women's Land Army is now functioning on a sound basis, and the girls in this organisation are doing a great job in a most efficient manner. Since the war started we have seen girls enter from all walks of life and amaze the public by their adaptability, determination and courage. In the rural districts the girls have had only admiration, and very little remains that they have not tackled satisfactorily. They are specially suited to vegetable and fruit growing, to work in wool rooms and to the use of machines. Farmers generally agree that the only fault to find with female labour is that it is "too careful"—surely a new description to be applied to Australian labour. The provision of accommodation for female labour may present difficulties, but with the help of War Agricultural Committees these may be overcome on all farms producing essential foodstuffs.

Efficient Use Must Be Made of Available Labour.

Finally, the youth of this country can still be mobilised to provide most useful manpower. Lads fifteen to eighteen years of age comprise a considerable force. Many of them are still at school, but ready to assist if called on under a suitable system of control individually or in gangs.

Statistics show that some 45 per cent. of rural labourers were lost to rural industries, but to offset this apparent loss, there has been a rapid intake of lads reaching eighteen years of age, many men are working again who had previously retired, while the womenfolk, especially on dairy farms, are doing a splendid job. It is considered by many that actual numbers have not as seriously affected production as the skill and speed of the available force. This point must be recognised, and War Agricultural Committees could possibly assist a great deal by educating both the worker and the employer in the most efficient use of the labour available.

In conclusion, I would like to stress that although the landholder is up against it, and his work is of the highest priority, we are facing a vast enemy force on our very door-step with determined and ruthless ideas of warfare. It is, therefore, up to every landholder to use all available labour which has been reserved for his sole use. It is essential that all estimates of required labour be in the hands of your National Service Officer in time to allow Manpower to mobilise the necessary forces to arrive on time to harvest the crops.

It is the opinion of Rural Manpower that, given a chance, the available labour can secure the necessary foodstuffs for the successful prosecution of the war, and shipment overseas to provide very real help to the allied nations.

A Pigmeat Quota Achieved.

MR. F. BOSTOCK, Senior Piggery Instructor, reports a favourable response to the appeal of the Commonwealth Government for increased production of pigmeat in the Lismore and Tweed area.

The quota allotted to the district was 203,400 pigs and every effort was made—both by personal contact with the farmers and per medium of the Press—to achieve it. So successful was the organisation that during the twelve months ended June, 1943, the number of pigs of pork and bacon weights sold for slaughter in the markets operating within the area was 200,270, or 98.5 per cent. of the quota.

Farm Tenancy in New South Wales.

The Agricultural Holdings Act, 1941, and its Application.

(*Continued from page* 309.)

Tenancy Agreements Between Landlord and Tenant.

A. W. S. MOODIE, H.D.A., H.D.D., Senior Agrostologist.

MANY of the disputes arising between landlords and tenants (including sharefarmers) are undoubtedly due to the absence of written agreements between the parties, setting out clearly the rights and obligations of each. The idea has been advanced that with the advent of the Agricultural Holdings Act, 1941, there will be no need for written agreements to cover tenancies. This assumption is entirely wrong, and the need for written agreements between landlords, and their tenants or sharefarmers is, if anything, greater than before the Act was passed.

A written agreement designed for a given farm is essential to the efficient operation of the farm, and it will certainly help to promote better relations between the owner and the operator. Both parties to the agreement know exactly what they have contracted to perform, and in the case of any doubt arising they can always refer to the agreement. Verbal arrangements cannot possibly promote such efficiency, and are more likely to result in disputes than to lead to harmony.

The fact that an agreement should be designed for a given farm is worthy of a more than passing attention. Chiefly with the object of avoiding legal expenses there is a tendency to adopt forms of lease in general use. An agreement which may suit the conditions existing on one farm may not necessarily apply to a neighbouring farm of similar character. Each case should be dealt with on its merits and a special agreement should be drawn up by a qualified legal practitioner. The fees charged by solicitors for preparing agreements between landlords and tenants are very moderate and are governed by a fixed scale of charges.

Tenants and sharefarmers are often suspicious of written agreements because they are not familiar with legal phraseology. As a rule the landlord is better acquainted with the nature of legal documents than the tenant, and the latter feels that he is at a disadvantage in agreeing to something he does not thoroughly understand. Actually there is little justification for this attitude. The majority of the clauses of written agreements covering tenancies, although capable of improvement, are couched in reasonably direct terms, whatever shortcomings they may have in other directions.

A written agreement has several advantages. In providing for the more important principles to be followed in farm operations, it prevents misunderstandings. Should it be necessary to modify any of the provisions because of changing conditions, a basis for discussion is readily available. When an agreement is signed it implies that all phases of the contract have been considered by both parties and removes grounds for recriminations later on. Finally, a properly designed lease will serve as a record of the working of the farm, it will provide a definite term for the duration of the tenancy, and the rent will be stipulated. It should be noted that the Agricultural Holdings Act, 1941, provides that notice to terminate a tenancy shall not be given less than twelve months before the expiration of the current year of the tenancy.

Forms of Agreement.

Several forms of agreement are necessary to cover the various types of arrangements made between landlords on the one hand and tenants and sharefarmers on the other. Agreements in common use are:—(1) Tenancy agreements; (2) dairy farm sharefarming agreements; (3) dairy farm, manager-sharefarmer agreements; (4) crop sharefarming agreements.

Where the Tenant Pays Cash Rent.

A tenancy agreement may be for a fixed term (that is a lease) or on a weekly, monthly, or yearly basis. It is to be noted that by the Agricultural Holdings Act future leases are to endure for a minimum of two years unless lawfully terminated at an earlier date. Further, other types of tenancies, by reason of the necessity of giving at least twelve months' notice to quit, shall endure for at least two years unless lawfully terminated at an earlier date.

Under an ordinary tenancy agreement the tenant or lessee pays a fixed rent at regular intervals for the use of the farm with its improvements. This system means that the tenant guarantees to pay to the landlord a certain rent without regard to fluctuations in price levels, operating expenses, or seasonal conditions. It is obvious that only those farmers with experience in farm management and who possess the necessary live stock and equipment should embark on such a venture. Should crop-growing constitute the principal business, a cash reserve is advisable to provide against adverse conditions.

Tenants prefer to rent farms in preference to other arrangements, because they have more independence in the operation of the farm, they receive a greater reward for skilful management, and operation in good years is more profitable. Some landlords prefer this system because their

income from the farm is definite, their farms do not require close supervision, and if the lease is properly drawn up controversies are avoided.

Farm Tenancy Agreement or Lease.

Any agreement or lease drawn up to cover a tenancy should include the following matters at least:—Names of parties to the agreement; period of tenancy; amount of rent and when and how payable; cropping systems to be followed; treatment of grasslands; ordinary duties which the landlord should require the tenant to perform; other miscellaneous clauses.

Cropping System to be Followed.

On the average dairy farm it will not be necessary to stipulate the area to be devoted to each crop, but a rotation of crops appropriate to the district and designed to conserve soil fertility should be arranged for each paddock used for cultivation. The landlord, in order to conserve the pastures, and to prevent the tenant from exploiting the whole of the arable land for the production of crops, may stipulate that only certain paddocks designated in the agreement shall be cultivated. The tenant will then be compelled to maintain the fertility of those areas he is permitted to crop. In this connection a clause may be inserted imposing a penalty upon the tenant for ploughing and cropping land which, according to the terms of the agreement, should be maintained under grass; but under section 27 of the Agricultural Holdings Act the landlord is entitled to recover a sum representing the actual damage suffered by him. In view of the practice of many tenants to plough grass land for cropping rather than to adopt measures to maintain the fertility of land already under cultivation, it is considered that every landlord should insist on a special clause in the agreement to cover this matter. The policy of using a new paddock for cultivation every few years, without fertilisers being applied to the crops, and allowing the old ones to revert to grass, is a form of soil exploitation the evil results of which become gradually apparent.

Where the agreement is designed to cover the production of crops rather than livestock farming, exact details of the rotation to be followed in each paddock may be agreed upon.

Treatment of Grasslands.

Such a clause may deal with the acreage of paspalum to be renovated each year, the lime and fertilisers to be used, the spreading of animal manure by the use of harrows, and the like.

The tenant's rights in the matter of ploughing up pasture land or established lucerne for the purpose of growing crops should be clearly defined.

Duties which the Landlord Requires of the Tenant.

The ordinary duties which the landlord should require the tenant to perform are important and should include:—

(*a*) The cultivation of the farm in a thorough and workmanlike manner.

(*b*) Not to sub-let the farm or any portion of it without the permission of the landlord.

(*c*) To keep the buildings, fences and other improvements in good repair.

(*d*) To take care of all trees, fruit trees, shrubs and vines; not to cut down growing trees without the permission of the landlord.

(*e*) To control all noxious weeds and noxious animals, and observe all laws relating thereto.

(*f*) To keep all drains and watercourses in good condition.

(*g*) To abstain from specified methods of tillage likely to result in soil erosion.

Other Tenancy Agreement Clauses.

The foregoing clauses should be included in every agreement. Other clauses may be inserted by mutual agreement between the parties. Under this classification would come insurances on buildings, pastures protection board rates and other rates and taxes, the supply of materials required for repairs and improvements, the rights of the landlord to enter to inspect premises and to make repairs and improvements.

As compensations for tillages, cultivations and standing crops are not provided for under the Act, the tenant should insist that his rights in these matters be clarified in the agreement.

A plan of the farm should be appended to every agreement, or a schedule may be drawn up recording the condition of each paddock at the commencement of the tenancy. The treatment of the various paddocks to be followed during the term of the tenancy may be set down in the schedule.

The agreement may include clauses dealing with improvements agreed upon by the landlord and tenant and to be carried out by the tenant. Items such as the supply of materials and labour should be included, or if the tenant is to supply both materials and labour the amount of compensation payable to him may be agreed upon. It should be noted that the amount agreed upon for compensation must be "fair and reasonable," if the improvement is one included in the First Schedule to the Act. A clause may be inserted dispensing with the necessity of giving any notice required to be given in respect of Part I and Part II improvements.

The Dairy Farm Sharefarming Agreement.

Many of the existing sharefarming arrangements relating to dairy farms are verbal, and frequently give rise to controversies between the landlord and sharefarmer. Written agreements would overcome many causes of friction, and are particularly necessary when the sharefarmer is working under an agreement with an absentee landlord who may seldom visit the property.

Many landlords prefer to engage sharefarmers because, under such arrangements, they are able to obtain the services of desirable farmers who would not have the capital necessary to operate as tenants. In addition, they may retain an active interest in the management of the holding.

Farmers often prefer sharefarming to tenant-farming because the risk is less, being based upon the net income of the farm. The amount of capital required is negligible, and a young farmer is often able to gain experience under

the guidance of a landlord who has been a successful farmer. In some cases the landlord is more willing to create permanent improvements than where the farm is operated by a tenant paying rent.

Sharefarming agreements covering operations on a dairy farm should include similar clauses to the "Farm Tenancy Agreement or Lease" and such items as length of tenure, cropping system to be followed, treatment of grasslands, and the tenant's rights regarding the ploughing up of pasture paddocks and lucerne for crop growing, should be dealt with. The particular clauses used will depend upon the intentions of the landlord in regard to control of farm operations and management. Should he intend to exercise full personal control, some of these clauses will not be required. On the other hand an absentee landlord would be advised to have defined in the agreement all matters relating to farm operations and management.

In a sharefarming agreement particular care is required in drawing up clauses covering the contributions of both landlord and sharefarmer to the joint venture.

High Producing Pasture of *Phalaris tuberosa* and Red and White Clovers.

Tenants are encouraged to establish such pastures when they enjoy security of tenure.

The landlord may contribute all the livestock and farm machinery and equipment, the materials necessary for repairs and improvements on the farm, and possibly any skilled labour employed in making such improvements. He may also contribute the whole or a definite proportion of the lime, fertilisers, and seeds used. He will probably pay all insurances on the farm and plant.

The sharefarmer will probably agree to supply all the labour required to work the farm in a satisfactory manner. Generally he will agree to cart to the farm all material furnished by the landlord for making farm improvements, and to supply all labour required for repairing and making improvements, except skilled labour.

Clauses covering those items to be furnished jointly and equally are important. These may include all grass seed, clover seed, lucerne seed, seeds for green manure crops, green crops for grazing, and seeds for grain crops. Arrangements governing the purchase of fodders, or the renting of agistment land should be clearly set out. The sharefarmer's right to depasture horses and cattle, his own property, should be dealt with, and it may be desirable to include a clause governing veterinary fees, breeding fees, and other incidental expenses.

In the case of a sharefarming agreement no cash rent is paid, consequently it is extremely important that the clause covering the division of farm income be clearly stated. The income from milk or cream may be divided equally, or as arranged and stated in the agreement. The sharefarmer may be allowed a fixed amount for all heifer calves reared. Proceeds from the sale of eggs, hay, grain, or other crops should be shared in such proportions as are agreed upon. Provisions relating to the sale of pigs must be included. It may be desirable to include a clause governing the use by the tenant of milk, poultry, eggs, pork, etc., for his own family.

The owner should require the sharefarmer to cultivate the holding in a thorough and workmanlike manner, to maintain fences and buildings in good repair, to care for trees, fruit trees, shrubs and vines, not to cut green timber, to control noxious weeds and animals and carry out any laws in connection therewith, to maintain drains and watercourses, and to avoid specified methods of tillage likely to cause erosion.

It is sound procedure to reach agreement regarding the business arrangements of the joint undertaking and to include them in the agreement. It is suggested that clauses be included to define arrangements regarding the authority of the sharefarmer to buy and sell stock, the banking arrangements, the keeping of records covering the farm operations, and the marketing of farm produce.

Clauses similar to those recommended under the heading of "Farm Tenancy" and covering the sharefarmer's rights to make improvements, other than those specified in the First Schedule to the Act, and compensation payable to the landlord for damage to the property should be used in all agreements.

Dairy Farm Manager—Sharefarmer Agreements.

Although this type of agreement may not come under the scope of the Agricultural Holdings Act, the following notes may be useful:—

The principal difference between this type of agreement and the straight-out sharefarming agreement will concern the income-sharing arrangements. The usual practice is for the manager-sharefarmer to be paid a wage corresponding to the amount he might earn as a farm hand, and, in addition, a share of the farm income. Labour and management (often under the close supervision of the owner) are the only contributions made by the farmer. Under some agreements of this type any additional labour required is paid out of farm income by the owner.

A landlord sometimes prefers an arrangement of this type when he desires to exercise close supervision of farm operations generally, and of

a high-class herd in particular. The manager-sharefarmer is guaranteed a wage and has the added inducement of a share in the profits. His risk in the venture is practically nil.

Many of the clauses used in sharefarming agreements will be applicable to manager-sharefarmer contracts. In connection with the division of farm income, the amount to be paid monthly to the manager should be stated, and the proportions in which it is decided to divide the net farm income at the end of the year or any other period agreed upon. As the wage to the manager is to be paid independently of the profits derived from the farm, a clause to this effect should be included in the agreement. To safeguard the interests of both parties the arrangements governing the handling of cash receipts and disbursements should be clearly defined. A clause defining the authority of the manager to sell or purchase livestock, hay, grain and farm produce generally is most necessary.

Crop Sharefarming Agreements.

(*a*) WHEAT GROWING.

Sharefarming has become extremely popular in the wheat-growing industry since its introduction about the year 1896. In many respects the procedure in regard to agreements is quite simple, being confined to arrangements covering the preparation of the land and the growing and harvesting of one crop only. The general form of the agreement used is similar for all districts, with certain modifications made, as required, to meet special conditions. Of late years it has been found necessary to utilise a few additional clauses covering the sowing of lucerne seed, or grass and clover seeds with the wheat crop, or the preparation of the land for the sowing of these seeds following the harvesting of the cereal.

Under the usual form of agreement the sharefarmer agrees to commence preparing the land before a stipulated date, to plough to a specified depth, to harrow the land thoroughly and to use seed and fertilisers at specified rates. He contracts to cut a track half a chain wide round the crop and to cart and stack the whole of the hay so cut, afterwards ploughing the track as a firebreak. The sharefarmer receives two-thirds of the hay and the landlord one-third.

Should it be deemed advisable to cut the entire crop or any portion of it for hay, the sharefarmer contracts to carry out all work, including carting, stacking and thatching. The hay so cut is usually divided in equal shares between the contracting parties, but the landlord pays to the farmer an amount per ton agreed upon for cutting, stacking, carting and thatching the landlord's share of the crop.

The sharefarmer agrees to harvest the grain crop and to deliver the landlord's share to some place agreed upon, all work to be done in a proper and workmanlike manner. The crop concerned is divided between landlord and sharefarmer in proportions agreed upon. As a bonus the sharefarmer is often given the surplus over an amount fixed by the agreement and not greater than a figure agreed upon, after which the division is again in equal shares. The sharefarmer agrees to cart the landlord's share of the crop to the rail or Government silos at a figure agreed upon.

The landlord agrees to supply all seed, fungicide, half the fertiliser, and the bags and twine for his share of the crop, and the sharefarmer half the amount of fertiliser, bags and twine for his share of the crop, and all machinery, implements, horses, materials and labour.

Other clauses deal with the farmer's rights to depasture horses, the control of noxious weeds and animals, the landlord's right to complete the contract at the sharefarmer's expense should the latter fail to carry out any work to the satisfaction of the landlord, and the sharefarmer agrees to leave the land, and to remove all machinery, etc., at the termination of the agreement.

(*b*) OTHER CROPS.

Properties utilised for the production of crops such as vegetables, bananas, maize, etc., are commonly operated by tenants and sharefarmers, and properly designed agreements should be entered into by the contracting parties. Basically such agreements should be similar to those suggested for use in dairying and wheat growing, with special clauses to meet the requirements of the industry concerned.

Where crops such as vegetables and maize are concerned it is essential that a system of rotational cropping be decided upon and incorporated in the agreement. The disposal of crop residues may need special consideration, and it may be necessary to insert a clause covering the grazing of paddocks by animals, especially pigs.

In the case of banana plantations and orchards generally, special clauses should be inserted in agreements, covering the growing of green manure crops and the use of fertilisers for the maintenance of soil fertility, the measures to be adopted for the control of insects, pests and fungous diseases and the observance of the law on these matters, the control of soil erosion, and the replacement of dead or worn out trees, vines and stools. The obligations of landlord and tenant or share-farmer in regard to the supply of seeds, fertilisers and chemicals should be clearly stated.

The chief concern of the landlord entering into an agreement covering any form of agricultural or pastoral production should be the maintenance of his greatest asset, the soil.

These notes are intended to serve only as a general guide to the type of terms and conditions to which regard should be had in drawing up agreements. The exact terms will be best left in the hands of solicitors.

(*To be concluded.*)

SOME NOTES ON . . . . .

FRUIT TREE IRRIGATION

On the Murrumbidgee Irrigation Area.

(*Continued from page* 366.)

J. R. DAVISON, Fruit Inspector.

IN the first section of this article, in the August issue, the author discussed a number of factors influencing irrigation practice, such as the effect of rainfall on irrigation, and the relation of soil types to penetration and tree growth.

In this concluding portion the necessity for judicious watering of young trees and for maintaining the humus content of the soil is discussed, while hints are given on methods of determining penetration rates and a home-made machine for constructing broad based furrows is described.

Handling the Young Tree.

Without irrigation, a tree grows at a rate governed by soil nutrients, rainfall, and temperature. Where autumn rains are sufficient to promote growth of trefoil, and this material has been incorporated, soil nitrate is built up during the fallow period. If there is no autumn rain, the seed remains until there is sufficient rain, maybe the next year, or even later, to germinate it and sustain the crop. The only loss in this natural rotation is the moisture when the crop has hayed off in the spring, and the surface soil is well supplied with plant food.

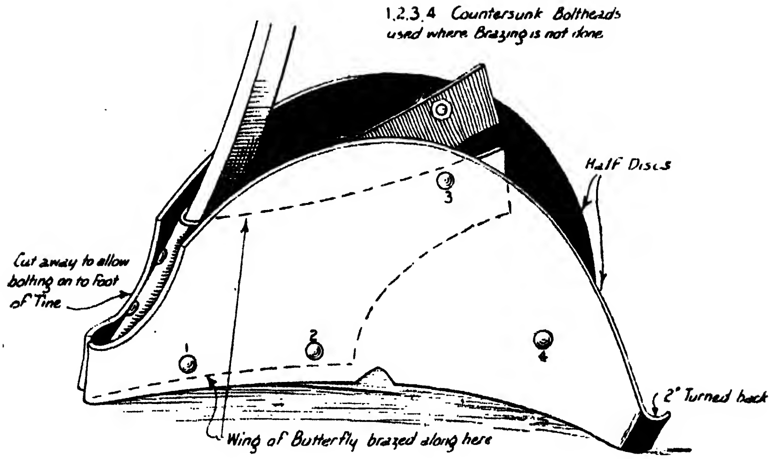
The orchard tree planted when such conditions obtain in the surface soil will thrive, its rate of growth practically being determined by the frequency of irrigation. If a system of clean and frequent tillage is followed, the young tree will make excellent growth, and it would appear that this is the right method. However, this is not the case, for under these conditions the tree is only living on its capital, and no provision is being made against the time when this store of nutriment will have been exhausted.

Moisture requirements are not great in the spring, and the young tree can make great strides, even in the poorer clay loams. It is at maturity—after a crop or two have been carried—that it becomes apparent that the root system is not adequate for the demands of the top, and that the wood and blossom ratio get out of balance. Symptoms, which vary with the kind of tree, are: Failure to set, excessive December drop, heavy pre-harvest drop, and failure to size the fruit.

Developing the Root System.

From the time of planting, the root zone should be kept above "wilting point," but not at "capacity," as this would require frequent saturations and would only force the tree. Roots will follow the moiture down as the soil layers progressively dry out, but if the soil at the surface is kept moist, they will develop a superficial habit. Deep ploughing will not send them down; it will only periodically remove feeding roots that the trees can ill afford to lose.

It is not wise to keep irrigating the area outside the scope of the roots, for in this way a water table may be built up in all but the stiffest of the horticultural soils. During the first twelve months of growth, the roots are shallow and only explore a circle of about 5 or 6 feet in diameter, and as far as possible only this area should be watered. For the first year or two, probably the best method is by a single furrow drawn down each side of the tree in the water-



Elevation of Broad-based Furrower.

Made from butterfly and plough disc.

Two of these are mounted on a cultivator frame.

run, and connected across by shovel, forming a square with the tree as the centre. If this square is kept weed-free and mulched, growth will be better and more permanent than if the trees are treated to a maximum of weed growth and water.

The Bay Between the Trees.

It has been long advocated that the bay between the trees should be early sown to a cover-crop, so that the soil humus will be maintained and improved as the trees mature. The clovers, including trefoil, seem to show the greatest promise for this purpose, as, apart from their value as soil enrichers, they do not compete with the tree in the summer months for soil moisture; and when the winter is dry, they make a lighter growth, hay off earlier, and in so doing put the least strain on the trees. If the growth is lush, it is quite easy to cut a furrow near the leaf drip of the trees with a disc plough in order to accomplish the first irrigation.

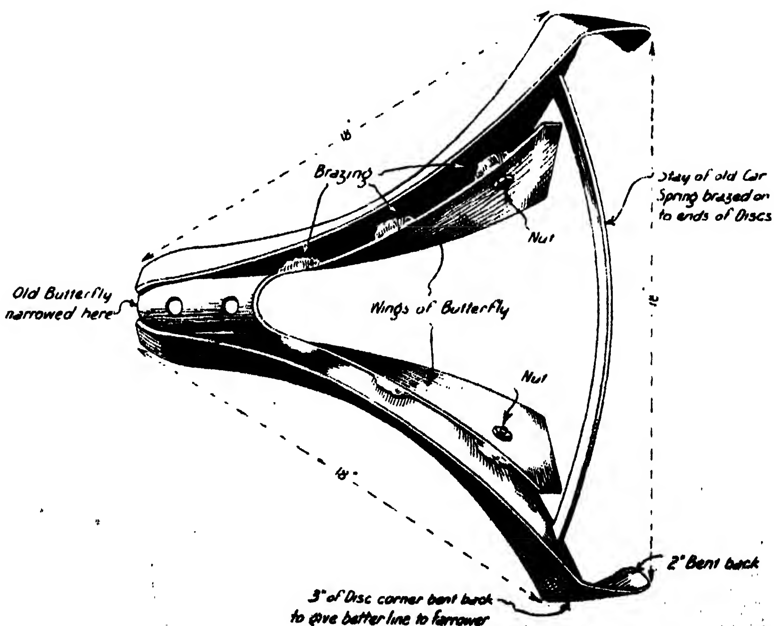
It should also be borne in mind that frequent tillage of dry ground during the summer only yields dust and depleted fertility. An irrigation applied late in August will, in most seasons, tide the trees over the critical period of blossoming and fruit set, a time when the less the functions of the roots are disturbed by either irrigation or cultivation, the better.

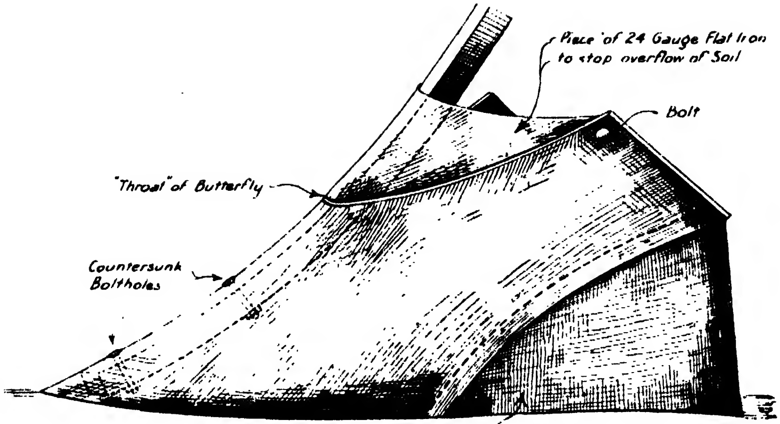
To Find Penetration Rates.

So far, much stress has been placed on irrigating only the root zone, and on the necessity of being familiar with the penetration rates of soils. How is the latter accomplished? Mainly

Ground Plan of Broad-based Furrower.

Showing method of brazing or bolting disc and position of stay.





Elevation of Another Broad-based Furrower.

Made by building-in furrowing-out butterflies.

by genuine interest and the use of a soil auger. The handiest type of auger can be made from an old wood bit, by removing the screw and cutting a "V" in its place, and lengthening the shaft to give a scope of about 4 feet.

During the winter the grower should spend some time getting acquainted with the soils of the orchard, and in noting the differences in soil moisture and texture every 6 inches down to the reach of the auger. He should also get to know the conditions referred to as "saturation," "capacity" and "wilting point," as these are the most important to him in correct irrigation practice.

Saturation.—While water is being applied, every space or interstice in the soil is filled, replacing air. These interstices vary in size and differ in function. Up to a certain limit, which is known as the *"capacity"* of a soil, water is held in tension in the smaller of the spaces, and is only removable by root action. The larger spaces lose their water, because the soil cannot hold the comparatively larger amounts in tension. Until these larger spaces are drained and "capacity" returned to, after the saturation of irrigation, root action is held up.

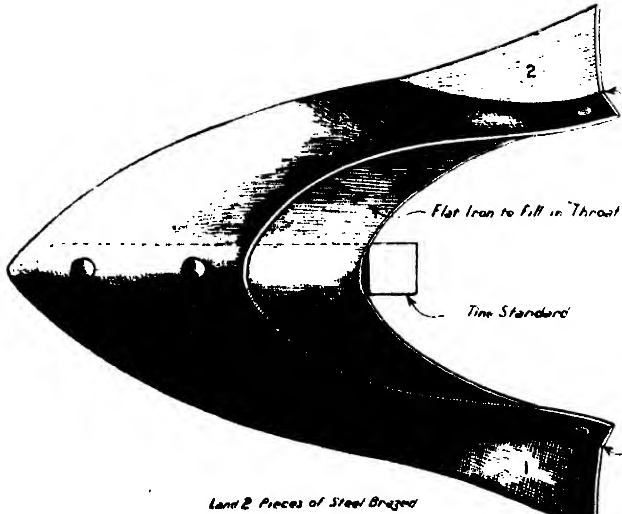
Wilting point is the downward limit of moisture content when even the roots cannot remove any more moisture, although there is some present; the amounts vary, as with "capacity," with the type of soil.

Above wilting point a handful of soil will feel moist, retain its shape when pressed in the hand, but will not exude moisture. At wilting point the soil will crumble easily, and a small amount pressed between the finger and thumb will exhibit little cohesion.

It is not advisable to test for penetration until control of water is obtainable, so it will be

Ground Plan of Furrower Shown Above

As many as required of these are mounted on a cultivatoe frame.



assumed here that any green crop or cover has been turned under, that clean furrows or crowder banks have been drawn, and that the soil is nearly wilted throughout the reach of the auger and below.

Choose bays in the different soil types in sets of four, and regulate the head so that maximum rate of flow, without scouring, is obtained. Then irrigate as follows:—1. Half-hour; 2. one hour; 3. one and a half hours; 4. two hours.

After about two days, test the depth of penetration with the auger. Suppose the results to be:—

	Top of Run. Inches.	Middle of Run. Inches.	Bottom of Run. Inches.
1.	14	12	10
2.	24	22	20
3.	36	34	32
4.	50	48	46

Then 1 and 2 would be too light, to almost enough; 3, a little heavy; 4, too heavy.

If there is too much difference between the readings at the top and the bottom of the run, it will be necessary to take steps to rectify the position by change of design, or by running the water down the centres of the rows, and starting on the bottom half, finishing up at the top.

Test the soil every two days, and note how it dries out progressively downwards. When discernible drying out has ceased throughout the root zone it is time to irrigate again. In subsequent irrigations, the same penetrations may take longer, as the soil compacts and does not absorb so readily, and allowance must be made as experience is gained, and in accordance with soil management. The penetration rates give the irrigator knowledge of the length of time to leave the water running, and are a sure guide as to when to water.

Where there is a water-table, the same routine is followed, but shorter periods should be given, as in these cases care must be taken to ensure that the penetration is not deep enough to meet the moisture in the capillary fringe arising from the water table. Light but more frequent waterings should be the objective.

To Make Broad Base Furrows.

The trend of irrigation practice to-day is in the direction of greater spread of water and exact control of depth of penetration. One of the great drawbacks to the use of the "V" type furrow, especially on flat ground, is the manner in which silting, clods, etc., reduce the flow of water. To obtain a good furrow it is necessary to go deeper into the soil than is altogether desirable. The area wetted is only small compared with the total, and there is the definite tendency to let the water run until the space between the furrows has become "black."

The main objection to the crowder is its habit of gouging soil away from the trees, especially on the headlands. It also moves too much surface soil and thus stops this important section from settling down to useful work. Yet it does give the desired spread of water over the surface, and allows a greatly increased head to be used.

A compromise between these two is to use the broad-based furrow. A very good implement known as the broad furrower can be used, but these are in short supply, and unfortunately at present it is impossible to have any more made. It is possible, however, to improvise, and the methods of making two excellent substitutes are described below. Home-made furrowers are constructed and bolted to a rigid standard and attached to a cultivator frame.

Number 1.—This has two furrowers and each is made out of a worn butterfly or duckfoot tyne and a worn out plough disc. The disc is cut into two half-circles. Each half is placed with the straight edge downwards, and the concave side outwards, along the sides of the butterfly. The butterfly is heated down the centre and bent in or narrowed until the distance between the back ends of the disc halves is about 18 inches. When this has been set up properly, the parts should be marked and drilled for bolts, or brazed. A strut is necessary between the wings to stop them collapsing under the weight of soil. The furrowers are bolted to rigid standards and attached to the cultivator frame.

Number 2.—Take the required number of furrowing-out butterflies and build in the cut-away portion of the wings by inserting shaped pieces of ⅛-inch or 3/16-inch steel plates so that the bottom edge presents a straight cutting line (see sketch). The throat has also to be filled in, but 24-gauge flat iron suitably fixed on is quite heavy enough. These furrowers are then attached to the cultivator frame.

Summary.

Some of the difficulties of irrigation on the Murrumbidgee Irrigation Area have been dealt with briefly; they may be summarised as follows:—

1. It is not possible to generalise about the amount of water that trees require.

2. The greater benefit afforded by rainfall is discussed, but it is shown that a substantial fall is required in the summer to replace an irrigation.

3. Soil type governs the potential value of the tree, mainly because of the variable rates of soil moisture movement; this inference is traced in an actual experimental case.

4. During heat-waves it is possible for trees to wilt, although there appears to be adequate moisture present in the soil.

5. It is essential that the young tree is not forced by injudicious watering if a balanced mature unit is to be achieved.

6. The area not immediately invested by the roots of the trees should be built up in humus content by a practice of cover-cropping practically from the time that the tree is planted.

7. Methods of making broad-based furrowers are described.

Side-grafting Apple and Pear Trees.

H. BROADFOOT, Special Fruit Instructor, and E. C. WHITTAKER, Fruit Packing Instructor.

A SYSTEM of re-working trees which renders them far less susceptible to attack by wood rot fungi, and in addition results in the trees cropping again several years earlier than those worked by the stump method, has been developed. This system is known variously as side-grafting, re-furnishing, frame-working, etc., and though the actual details of the operation may vary slightly according to the operator's ability and views, the principle is basically the same—i.e., to retain as much of the tree's original framework as possible or desirable, and replace the fruit-carrying surface of the tree with the desired variety. Naturally, this method is more costly than the old one, but its advantages more than compensate for the increased initial expense.

Preparation of Stock Trees.

As a general rule, it is desirable to delay the stripping of the stock tree until just prior to grafting.

The trees may be completely stripped of all spurs, laterals and small branches, and the whole framework side-grafted, or an alternative method is to retain all suitable small limbs and laterals in good positions, and graft them by the method described later—filling in where necessary with side grafts.

Fameuse Tree Worked to Delicious.
The top of each limb has been strap grafted, and the remainder of the tree side grafted.

Of the two methods, the latter is undoubtedly the better, as there does not seem to be any good reason for cutting out small limbs, etc., in good position. It is a sound practice also—particularly if the grafting is being done fairly late—to leave a few spurs, etc., scattered along each limb to draw the sap and to help in the prevention of sunburn.

It is suggested that the topping be done at a point on the limbs which does not exceed 1¼ inches in diameter.

The matter of spacing the scions should be kept in mind when stripping the trees, if it is desired to utilise laterals and small limbs, etc., for stub-grafts. It should be remembered that the idea is not necessarily to re-furnish the tree with approximately the same number of spurs, laterals, etc., as appeared on the original tree. Most of the new grafts, if treated correctly, will develop, if required, into small limbs; thus, it is needless waste of time and material to put on more scions than required.

Generally speaking, if the scions are spaced 8 to 10 inches, or even 12 inches, apart there will be ample for the purpose, and on large old vigorous trees this distance may be increased to even 15 to 18 inches and still provide all the bearing surface required.

Selecting Scion Wood.

When selecting wood for grafting purposes, care should be taken that it is obtained only from the best type of trees available; *i.e.*, mature trees which have consistently borne heavy crops of good quality fruit. Select only well-matured wood of the current season's growth, with well developed buds and free from pest or disease. The best developed buds are formed on about the centre half of a lateral; therefore, avoid using the butt ends or tips, if possible.

Laterals carrying weak or latent buds, and also strong growing water-shoots, should be avoided.

A good supply of scions should be collected, as it is poor policy to skimp the grafts, and the selected wood should be of varying thicknesses—the larger ones for strap and stub-grafts and the remainder for bark side-grafts.

Preparing the Scions.

When cutting scions, the most obvious essential is a good sharp knife. Scions should be selected according to the thickness of the stock bark, so as to avoid splitting as much as possible.

The main cut on the scions should not be over-long—from 1¼ to 1½ inches is ample, with the usual run of scions—and advantage should be taken of the slightly zig-zag nature of the wood when making the cut, to give the scion a slight heel.

With any type of bark graft, it is advisable to remove a thin slice of bark and wood from the back of the point of the main scion cut. This

results in a fine, chisel-like point which facilitates pushing the scion into position under the bark of the stock limb. This latter cut, however, need only be about 3/8 to 1/2 inch in length.

Several Methods Described.

The three most popular methods of side-grafting in this State are the "inverted L," the "converging cut or V" graft, and the "awl or slit" method, and for all practical purposes these three are ample.

With this method, an inverted L-shaped incision (thus ˥) is made through the bark at an angle of about 40-45 degrees to the axis of the limb. The long cut of the L should be about 1¼ inches in length, and the shorter cut about ½ inch. The corner of bark in the angle of the L is raised, and the scion pushed well under the flap of bark. A fine tack or panel pin is then driven through the bark and scion into the main limb to hold the scion firmly in position. The graft is then sealed to exclude air and moisture.

In cases where the bark of the stock tree is fairly thick, it is advisable to remove a tapering slice of bark above the angle of the L so that the scion will fit neatly on to the wood of the stock. If this is not done, the scion will be squeezed against the edge of the bark underneath, and result in a weak spot in the union.

The handiest and best method of making the incision in the bark is by means of a small L-shaped punch—easily made by any blacksmith.

The "Converging Cut or V" Graft.

This is a simple, and possibly the neatest method used. A small cut is first made at a slight angle from perpendicular, and then a second one below it, not quite parallel to, but converging slightly towards the first at the lower end—so that the space between the cuts at the lower end is just wide enough to allow the entry of the scion. This second cut may be continued as a light score of the outer bark for an inch or so, to allow the bark to expand slightly when the scion is pushed home, thus preventing the bark from splitting.

A third cut is then made to join the tops of the two side cuts. This cut is made through the bark at an angle, giving a bevelled and not a square edge, and the blunt V-shaped piece of bark can be broken away with an upward flick of the knife, which for this work should have a rounded, sharpened end.

The scions should be pushed home to the full extent of the cut thereon, and where the bark is reasonably thick tacks may be dispensed with, as the scions will be clamped into position sufficiently by the uncut bark.

It is advisable, however, to use fine tacks or panel pins in thin bark. Sealing completes the operation.

The "Slit or Awl Method."

This is possibly the quickest method used, and therefore is most popular.

A strong pointed knife may be used for making the incision in the stock bark, but by far the best way is to use a type of awl made from a large-sized packing needle. A quarter inch or so is cut from the point, which is then ground down to a chisel edge and a handle affixed to the eye end.

In practice, the chisel-like point of the needle is pushed through the bark at a slight angle, until the wood is felt. It is then pushed along the wood for a short distance or until such time as a slight leverage on it will cause the bark to open up sufficiently to allow the entry of the scion. The point of the scion is then inserted between the needle blade and the wood, the needle withdrawn and the scion pushed home.

When a knife is used for making the initial slit, care should be taken to see that the scion is pushed between the bark and the wood, as it is very easy, especially with thick bark, to insert the scion merely between layers of bark. Thick scions should not be used for this graft, as they tend to open up the slit bark too much.

After insertion, the scions are tacked and sealed, although here again as with the V-graft, in thick bark the use of tacks is not altogether necessary, as the scions are clamped down firmly by the pressure of the bark above them.

The Oblique-Cleft Stub-Graft.

This is the simplest and quickest way of grafting small lateral stubs when refurnishing. Any small limbs or shoots from as thick as a pencil to about ½ inch in diameter, are suitable for this method of grafting.

The small limb to be grafted is prepared by making a slanting cut on the top side to almost half way through the limb, commencing about 1 inch from the base of the twig and extending obliquely towards the main limb.

The scion is prepared by making a wedge-shaped cut, having one side slightly longer than the other. The limb is then bent downwards, thus opening the cut and the prepared scion pushed firmly into place, care being taken that the longer cut of the wedge is downwards.

As with the whip-tongue graft, if the scion is smaller in diameter than the stock-piece, it should be placed to one side of the stock cut to ensure that the cambium layers of both are in contact. When the scion is in position, the limb may be released and cut off above the graft—which, being clamped into position firmly by the spring of the limb, needs no tacking or tying. Careful sealing over the whole wound area completes the operation.

It isn't clever to talk of military matters.

It's Disloyal.

THE POTATO MOTH.

Experiments on its Control.

(*Continued from page* 337.)

N. C. LLOYD, B.Sc.Agr., Assistant Entomologist.

THIS is the second section of an article, the purpose of which is to summarise the research that has been conducted into the control of potato moth by the Department during the past three years. Last month the author dealt with life-history studies and insecticidal experiments; the following section records observations made in regard to field control by means of cultural practices.

Cultural Control.

By cultural control is meant the minimising of moth damage by appropriate cultivation operations; it represents a very valuable and comparatively cheap means of combating the pest.

Earlier work carried out on this aspect of the problem indicated that deep planting reduced the infestation as did hilling to a certain extent. The results obtained, however, were not very striking. It was thought that the comparative lack of success with hilling was due to the fact that a sufficiently thorough hill was not being obtained Consequently, in a series of experiments carried out at Millthorpe in 1941-42 care was taken to obtain a very thorough hilling, drawing the soil around the bases of the plants with a rake-hoe after hilling.

The experiments summarised in this article were carried out by Mr. W. L. Morgan, of the Entomological Branch, and the writer.

Roslyn Experiments.

An experiment was carried out at Roslyn in 1939-40, with a normal 4- or 5-inch depth of planting, in which no hilling, hilling at forty-six days and hilling at sixty days after planting, were compared. Results showed there was a significantly higher percentage of clean tubers in both the hilled treatments, but this was by no means striking, and there was no advantage to be gained from hilling. This was because there was no significant difference in weight yield of clean tubers—due to the tubers in the hilled plots being smaller.

In 1940-41 a further experiment was carried out at Roslyn to compare the effects of flat cultivation as opposed to hilling. The planting was at depths of 5 and 7 inches, and the hilling was done forty-nine days from planting.

The results showed a definite and substantial reduction in infestation at 7-inch planting as compared with the 5-inch planting. There was a slight but non-significant reduction in infestation occasioned by hilling at forty-nine days as compared with no hilling.

The figures were:—

A. 5-inch planting, no hilling, 68.5 per cent. infestation.

B. 5-inch planting, hilling, 60.4 per cent. infestation.

C. 7-inch planting, no hilling, 44.1 per cent. infestation.

D. 7-inch planting, hilling, 42.1 per cent. infestation.

In conjunction with this experiment, observations were made on the relationship between depth of tuber setting and moth infestation. Careful measurements of the least distance from the soil surface to the tubers from a selected number of plants were made

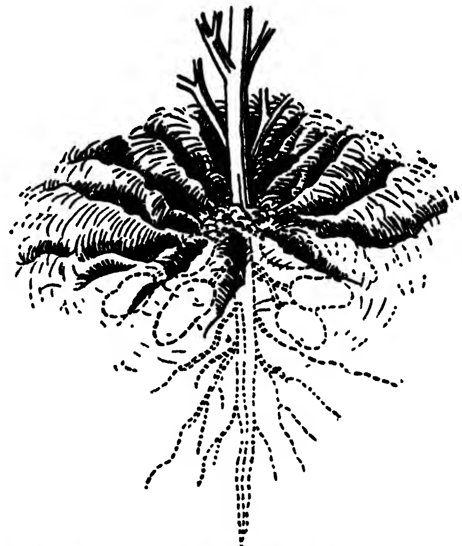


Diagram showing how the Swelling of the Tubers causes Radial Cracks to Form when the Soil is Dry and Hard.

The data can be summarised as follows —

	Percentage Infestation.
Section A.—	
Tubers 1 inch or less from the surface	75
Tubers between 1 and 2 inches from the surface	24
Tubers between 2 and 3 inches from the surface	7
Tubers more than 3 inches from the surface	3
Tubers 2 inches or less from the surface	57
Tubers more than 2 inches from the surface	5
Section B.—	
Tubers 1 inch or less from the surface	83
Tubers 1 to 2 inches from the surface	33
Tubers 2 to 3 inches from the surface	10
Tubers more than 3 inches from the surface	0
Tubers 2 inches or less from the surface	62
Tubers more than 2 inches from the surface	7

It will be seen that there is a close correlation between the two sets of figures, sections A and B. It was concluded that effective protection of the tubers in the ground would be obtained if a cover of 2 inches or more of soil could be kept over them.

Investigations by Mr. Morgan in 1941 embraced the testing of a 4-inch and 7-inch planting; a 2 feet 4 inches and a 3 feet spacing; and flat cultivation, early hilling and late hilling, in relation to depth of tuber-setting. Planting in a 12-inch trench, combined with flat cultivation and late hilling, was also tested.

On the basis of the coverage of soil over the tubers the results suggested:—

1.—The value of hilling late (about ten weeks after planting).

2.—The value of planting deeply with the rows wide enough apart to permit of a large wide hill.

3.—Planting in a trench and later dragging the soil from between the rows round the plants.

4.—The same operation as above, but in addition, a subsequent hilling.

It was decided to arrange a comprehensive series of experiments for the following summer to test these ideas on a field scale.

EXPERIMENTS AT MILLTHORPE, 1941-42.

A series of experiments was commenced at Millthorpe in November, 1942, to test thoroughly the value, principally, of (*a*) deep planting; (*b*) different times of hilling, and (*c*) width of planting (both singly and in combination) in reducing tuber infestation. In addition, the effect of trench-planting and of different modes of hilling was tested.

Experiment No. 1.

In this, the main experiment, there were sixteen different cultural treatments, consisting of all combinations of:—

2 ft. 4 in. spacing	5 in. planting	No hilling.
3 ft. spacing	9 in. planting	Early hilling.
		Intermediate hilling.
		Late hilling.

The actual depths of planting averaged 5.3 inches and 8.7 inches, but these were sufficiently close to the required depths, and at the same time removed enough from each other to provide a good comparison. The early hilling was carried out forty-nine days after planting, the intermediate sixty-five days and the late hilling seventy-nine days after planting. The season was a particularly unfavourable one for growth, and the tuber development was correspondingly delayed, hence the times after planting are longer than would be the case in a more normal growing season. The aim, however, in early hilling was to hill before the rhizomes commenced to develop; in intermediate hilling to hill during rhizome development and in late hilling to hill after all rhizome development had ceased, and the tubers were starting to swell.

The 3-feet spacing was included as it was expected that with a greater quantity of soil between the rows, a larger and better hill could be obtained, and it would be easier to get between the rows in carrying out a late hilling.

The type of hill aimed at was a broad one, rounded in cross-section and with the soil heaped well up round the bases of the plants, where cracking originates. It was not found possible to do this with the hilling implement used, so the work was finished off with a rake-hoe so as to draw the soil well round the bases of the plants, giving a theoretically perfect hilling.

Results of No. 1 Experiment.

Time of Hilling.—The results got by hilling were very striking. Late hilling was superior to intermediate, intermediate to early and early to no hilling at all. This held good whether there was deep or shallow planting and narrow or wide spacing.

The mean infestation over the whole experiment was:—

No hilling, 51.5 per cent. infestation.
Early hilling, 34.2 per cent. infestation.
Intermediate, 26.4 per cent. infestation.
Late hilling, 16.1 per cent. infestation.

The probabilities were that an even later hilling would have still further reduced infestation. There was no indication of any loss of yield due to hilling. The yield of clean marketable tubers was considerably greater in the hilled plots. The average over the whole experiment worked out at:—

No hilling, 1.43 tons per acre of clean tubers.
Early hilling, 1.58 tons per acre of clean tubers.
Intermediate hilling, 2.29 tons per acre of clean tubers.
Late hilling, 2.40 tons per acre of clean tubers.

Planting Depth.—The average infestation for the whole experiment was:—

5-inch depth, 41.4 per cent. infestation.
9-inch depth, 22.8 per cent. infestation.

Deep planting gave a greatly reduced infestation at both spacings, and in hilled and unhilled plots alike. Its effect was particularly noticeable, however, in the unhilled plots where a reduction in infestation, from 66 per cent. in the shallow to 36 per cent. in the deep planting, was recorded.

Late hilling was the most successful single cultural operation in reducing infestation; however, a combination of intermediate or late hilling and deep planting gave a significantly lower infestation than either operation alone.

Deep planting and late hilling, 12.4 per cent. infestation.
Late hilling alone, 19.8 per cent. infestation.
Deep planting alone, 36.7 per cent. infestation.
Shallow planting, no hilling, 66.4 per cent. infestation.

Where moth infestation is regularly severe, therefore, both measures are necessary and are to be recommended.

There was no indication that deep planting reduced the yield but rather the reverse. The yield of clean tubers over the whole experiment was 2.25 tons per acre in the deep-planted plots, compared with 1.64 tons per acre in the 5-inch planting.

Spacing Between the Rows.—There is an indication that the wider spacing gave a slightly better hill, with a resultant lower infestation than in the narrow-spaced plots. The effect was much more noticeable in the shallow-planted plots; in the deep-planted plots the effect was masked by the initial depth of soil over the tubers. Where, therefore, deep planting (at least 7 or 8 inches) cannot, for some reason, be done, it is necessary to space the rows wider apart to allow of better hilling. At least 2 feet 9 inches or twenty-four rows to the chain is recommended. Wide spacing did not reduce yield.


Make 'em Last
DON'T FORGET THE HIDDEN PARTS!
Give your Car or Truck
Regular
MOBILUBRICATION
Service
Mobilubrication is the complete lubrication of every part of your car or truck with correct grades of Mobiloil
Go where you see the Mobilubrication Sign.
Cars last longer with
Mobiloil
THE WORLD'S QUALITY OIL
Play Safe! For full engine protection and freedom from lubrication troubles—longer car or truck life and maximum petrol mileage—always use Mobiloil.
VACUUM
QUALITY PRODUCT
VACUUM OIL COMPANY PTY. LTD.
(Incorporated in Australia)

Summary.—Deep planting and late hilling are to be recommended, preferably in conjunction. As deep a planting as possible (up to 8 or 9 inches) can be recommended as a regular practice.

Hilling when the rhizomes are well developed and the tubers up to half an inch in diameter is to be recommended, except where the season has been exceptionally unfavourable to moth. The hilling should be such as to throw the soil well up round the bases of the plants.

Where hilling is to be done, a spacing of at least 2 feet 9 inches or twenty-four rows to the chain should be given.

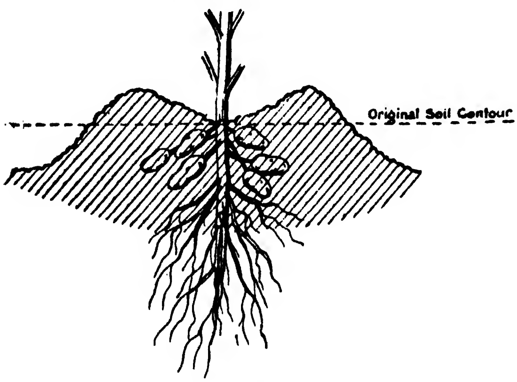


Diagram of the Type of Hill Very Frequently Seen.
The soil is not thrown round the bases of the plants, and the cracks are not filled in.

Experiment No. 2.

This experiment was designed to compare the effects of—

(1) One scuffling; (2) two scufflings; (3) the "hiller" alone; (4) a "perfect" hilling as given in Experiment No. 1.

The first scuffling was given sixty-five days from planting and the other treatments seventy-nine days from planting. The rows were 2 feet 4 inches apart and the planting depth 9 inches. There were six replications.

The average results were as follows:—

Treatment 1, 20.81 per cent. infestation.
Treatment 2, 21.20 per cent. infestation.
Treatment 3, 13.70 per cent. infestation.
Treatment 4, 9.20 per cent. infestation.

The figures show that a "perfect" hilling is a considerable improvement on the hiller alone in reducing infestation. The hiller alone was superior to the scuffler, with which a lot of hill ing is at present carried out and which is an inferior implement for this purpose. An implement with large long plates capable of pushing a big and broad mound of soil well up against the plants is essential for best results.

It must be pointed out again that in this experiment the tubers were planted 9 inches deep, so that there was a big primary reduction in infestation due to the depth of planting. Shallow planting would no doubt have demonstrated even more clearly the superiority of a "perfect" hill over the other treatments.

Experiment No. 3.

In this experiment the effects of the following treatments were compared:—

1. The hiller alone.
2. The single furrow mouldboard plough alone.
3. A "perfect" hilling.

Hilling was done eighty-nine days from planting. The planting depth was 9 inches and the spacing 3 feet. There were seven replications.

The results were as follows:—

Treatment 1, 19.1 per cent. infestation.
Treatment 2, 13.0 per cent. infestation.
Treatment 3, 7.5 per cent. infestation.

The "perfect" hilling again proved very definitely superior to hilling alone and to the plough. The plough was superior to the hiller alone, probably due to the soil being thrown more thoroughly round the bases of the plants by the twisting and inverting action of the mouldboard. The plough is, however, more difficult to use (as well as much slower) than the hiller, and it is considered that the best implement would be the hiller fitted with long plates which have a slight twist so as to invert the soil after the manner of a mouldboard.

Experiment No. 4.

This experiment, and the following one, were designed to investigate the effect of trench planting in lessening tuber infestation. In trench planting a depression or trench is left along the rows with enough soil to cover the tubers, and filled in at subsequent stages of growth. The depression was obtained at planting by adjusting the 4-furrow plough so as to lift the front share out of the ground a good deal, which gave quite a good result.

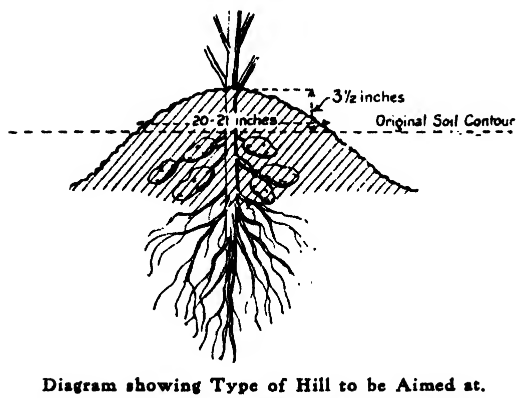


Diagram showing Type of Hill to be Aimed at.
Such a hill was obtained at Millthorpe; it is broad and rounded in cross section, with the soil drawn well round the bases of the plants so as to fill in the cracks.

The effect of such a planting should be that the rhizomes would develop at a lower level than in the case of the flat planting; and when the soil is finally all thrown back on to the rows the tubers will be, on the average, deeper than where flat planting has been done.

The treatments in this experiment were:—

1. Flat planting, and not hilled.
2. Flat planting, and hilled.
3. Depression planting, filled in by cultivation.
4. Same as 3, but hilled in addition.

The planting depth was 9 inches and hilling was done eighty-nine days from planting.

The results were as follows:—

Treatment 1, 30.62 per cent. infestation.
Treatment 2, 7.12 per cent. infestation.
Treatment 3, 25.56 per cent. infestation.
Treatment 4, 3.55 per cent. infestation.

Planting in a depression reduced infestation somewhat, but was not nearly such an important factor as late hilling in this regard.

The effect from late hilling was very striking. There was noted a slight reduction in yield from hilling, but the yield of clean marketable tubers was considerably greater in the hilled plots.

Experiment No. 5.

In this experiment an endeavour was made to compare the effect of planting in a depression and then filling in the depression at different stages in the growth of the crop, and of hilling in addition.

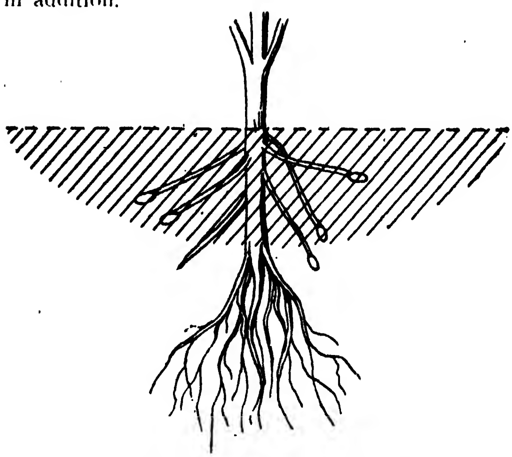


Diagram showing the Stage of Development of Underground Rhizomes and Tubers at the Best Time to Hill.

The rhizomes development is complete, and the tubers are commencing to swell. This was the stage when late hilling was carried out at Millthorpe.

The treatments were:—

1. Depression filled in thirty-three days after planting.
2. Depression filled in forty-seven days after planting.
3. Depression filled in sixty-three days after planting.
4. Depression filled in sixty-three days after planting and hilled eigthy-nine days after planting.

The planting depth was 9 inches.

The results were as follows:—

Treatment 1, 43.7 per cent. infestation.
Treatment 2, 33.2 per cent. infestation.
Treatment 3, 40.1 per cent. infestation.
Treatment 4, 3.06 per cent. infestation.

The figures show that planting in a trench and filling in at any time up to sixty-three days from planting was a failure. There was no indication that delay in filling in up to sixty-three days from planting was of any value. Late hilling again gave a very striking result and was much more valuable than trench planting in lessening infestation.

Relationship between Depth of Tuber Setting and Infestation.

Careful and detailed measurements of tuber depths were made in conjunction with Experiments 4 and 5.

EXPERIMENT No. 4.

Depth of Tuber Setting in Trench-planted Plots Compared With That in Flat-planted Plots.

(a) Unhilled (Treatments 1 and 3).

The results were as follows:—

	Treatment 1.	Treatment 3.
Average tuber depth ...	3·63 in.	3·97 in.
Maximum depth.........	6¼ in.	7 in.

The seed piece was planted 8.7 inches deep so that all tubers were set well above this.

The depression planting resulted in tubers being slightly deeper set (0.34-inch on the average) than in the flat planting.

(b) Hilled Plots (Treatments 2 and 4).

The measurements were as follows:—

	Treatment 2.	Treatment 4.
Average depth ..	6.43 inches	6.93 inches
Deepest tuber ..	10 inches	9 inches

These figures at once explain the big reduction in infestation caused by hilling. The average tuber depth was nearly twice that where there was no hilling and the bulk of the potatoes (63.4 per cent. in Treatment 2 and 75 per cent. in Treatment 4) had over 6 inches of soil over them. Hilling was responsible for drawing an extra 3 inches of soil over the tubers; there were no tubers at a depth of less than 3¼ inches.

Both with and without hilling the effect of depression planting as against flat planting was to give a slightly greater soil cover which was reflected in a slightly lower infestation.

The effect of trench planting was insignificant compared with that of late hilling, and such a planting could in no way be regarded as a practical control measure.

Expectancy of Infestation at Various Depths.—Depth classes of 1 inch in range were set up and the percentage of infestation in each depth class was calculated. A very interesting series of figures was obtained, agreeing very closely as between the various treatments.

They showed that where no hilling was carried out, 4 inches and over was a safe depth, only 4.2 per cent. of tubers below that depth being infested. Tubers 2 inches or less in depth had virtually no chance of escaping infestation.

In the case of the hilled treatments very few tubers were within 4 inches of the surface, thus explaining the low infestation figures for those treatments.

These findings differ markedly from those obtained the previous year at Roslyn (see earlier in this article) where 2 inches was found to be

a safe depth. In this case, however, tubers were planted 9 inches deep, as against 5 inches and 7 inches deep at Roslyn, and were set at a much greater depth.

The explanation would appear to be that at Roslyn tubers round about the 2-inch depth were the deepest and were below the large majority of the tubers, which latter would first attract the attention of larvae. Therefore, it may have been that at Roslyn, if so many tubers had not been set at a depth of less than 2 inches, tubers at depths of 2 to 4 inches would have become infested, the safe depth becoming greater.

It is obviously impossible to lay down a "safe" depth for tubers that will hold good for all conditions. This depth will be greater in soils of poor physical properties which dry and crack badly in dry seasons, and where there is a severe outbreak of the moth. In friable soils the "safe" depth will be shallower.

In this experiment, 4 inches and over was a safe depth; it is hard to imagine tubers deeper than this being liable to extensive attack under any conditions.

Conclusion.—Tubers at a depth of 4¼ inches or more were for all practical purposes safe from moth infestation.

Depth of Tuber Setting.

EXPERIMENT NO. 5.

A comparison of the three unhilled treatments gives the following figures:—

	Treatment 1.	Treatment 2.	Treatment 3.
Average depth	3·43 ins.	3·91 ins.	3·57 ins.
Greatest depth	6¾ ins.	7 ins.	7·¾ ins.
Per cent. infestation ...	43·71	33·2	40·1

It can be seen that the order of infestation in the three treatments corresponds to the average depth of the tubers.

Comparisons of treatments 3 and 4 to show the effect of hilling appear in the table below:—

	Treatment 3.	Treatment 4.
Average depth	3·57 ins.	6·56 ins.
Maximum depth	7¼ ins.	9 ins.
Per cent. infestation	40·1	3·06

Hilling, therefore, added an extra 3 inches of soil over the tubers. In the hilled plots there were no tubers less than 3¼ inches from the surface and only 3½ per cent. of the tubers were less than 4 inches deep. This closely corresponds to the figure for infestation, 3 per cent.

Expectancy of Infestation at Different Depths.—The critical depth was again found to be 4 inches, only 6 per cent. of tubers below that depth were infested.

For example, at depths of 3¼ to 4 inches, there were 31.2 per cent. of tubers infested, whereas at 4¼ to 5 inches, there were 8.7 per cent.

Briefly:—

At soil level to 1 inch deep the tubers were certain to be infested.

At 1¼ to 2 inches there was very small chance of escape.

At 2¼ to 3 inches the majority of tubers (two out of three) were infested.

At 3¼ to 4 inches, tubers were by no means safe, one-quarter to one-third being infested.

At 4¼ to 5 inches very few, only 8.7 per cent., on the average, were infested.

At 5¼ to 6 inches, only odd tubers were infested.

At over 6 inches, the chances of infestation were very remote.

Thus, to obtain a satisfactory measure of control over moth infestation it was necessary to have a depth of soil covering amounting to 4 inches and upwards. This was obtained by none of the depression-planting treatments without hilling, but was obtained by hilling late when all the tubers had commenced to form.

(To be continued.)

National Planning and International Stability.

NATIONAL planning of Australian agriculture cannot be undertaken without regard to international demand, unless our industries are to be so reduced that they meet only domestic needs. All our great industries—wheat, wool, meat, dairy products and sugar—are dependent for prosperity on overseas demand. While full employment at home and a higher standard of living, by increasing home consumption, will affect the relative importance of domestic and overseas demand, Australia cannot enjoy full prosperity without fully maintaining and expanding agricultural production.

Security from war will affect vitally the agricultural programme of such a country as Britain and help to restore its importance as a market for Australian products. International economic planning designed to raise living standards will increase demand for wool, meat and dairy products. The industrialisation of China and India will lead to steadily increasing demand for imported foodstuffs and clothing fibres. In the immediate post-war period, Australian agriculture must be planned in relation to the clothing and feeding of war-stricken countries, under the United Nations Rehabilitation agreement.

Until normal channels of trade are re-opened, governmental controls, not only of production but of marketing, must be imposed. Major export surpluses must be bought by the Commonwealth Government at fair prices to the producer and made available at such prices and under such conditions as are agreed upon by international commodity organisations.

The future of Australian agriculture beyond all question is bound up for good or ill with international security and freedom from want and fear.—Prof. I. CLUNIES ROSS, at the Agricultural Bureau Conference.

INSECT PESTS.

Notes contributed by the Entomological branch.

APHIDS, OR PLANT LICE.

(*Aphididae.*)

BECAUSE of their small size, and often, concealed positions, aphids are frequently overlooked until they have increased to considerable numbers. Amongst those which frequently attack orchard trees are the green peach aphid (*Myzus persicae*), the black peach aphid (*Anuraphis persicae-niger*), the cherry aphid (*Myzus cerasi*), the citrus aphids (*Toxoptera aurantii* and *Aphis* sp.), and to a lesser extent the woolly aphid (*Eriosoma lanigerum*).

The most prevalent aphids amongst vegetable crops are the green cabbage aphid (*Myzus persicae*), and the slaty-grey cabbage aphid (*Brevicoryne brassicae*), the green tomato aphid (*Macrosiphum solanifolii*), bean aphids (*Aphis* spp.), the melon or pumpkin aphid (*Aphis gossypii*) and the carrot aphid (*Cavariella* sp.).

Cultivated ornamental plants and shrubs, etc., serve as primary or secondary hosts of a large number of species of aphids.

Aphids or plant lice comprise a large group of small, soft-bodied insects which may be found on the undersides of leaves, around flower buds and on the young shoots and bark, or on the roots of plants; others again may live in galls. Some species, by means of special glands, secrete varying amounts of a white waxy substance which may be either powdery or woolly, and this may cover their bodies; but most species are without any protective covering. They are of various colours, depending upon the species and sometimes upon the food-plant.

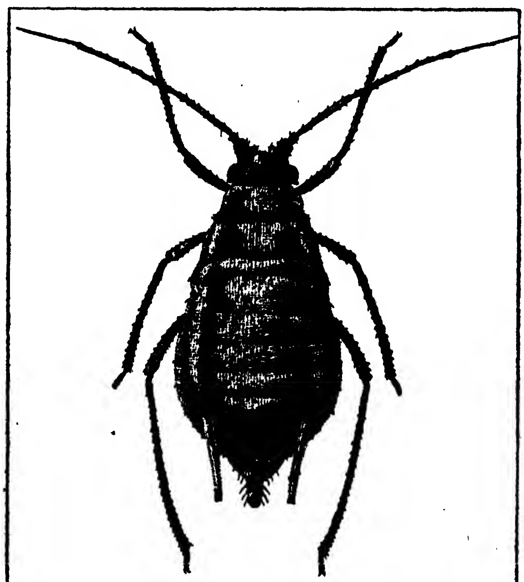
Most aphids possess a pair of characteristic tubular processes, known as cornicles, which arise from the fifth segment of the abdomen, but in some species these organs may be reduced or absent. These cornicles secrete a waxy fluid which may protect them from some of their predaceous enemies.

Aphids possess sucking beaks, and feed by puncturing the plant tissues and extracting the sap from their host plants, and thus, when abundant they may cause the drying up and curling of the leaves and distortion of the buds and flowers, and weaken the whole plant. Some aphids cause scars and gall-like swellings to form on the limbs, twigs or roots of the plants. Aphids are also capable of transmitting various plant diseases.

Most species excrete quantities of "honey-dew," a sugary secretion which adheres to and disfigures the foliage upon which it falls, and a black sooty mould which develops in the "honey-dew" adds further to the disfigurement. Ants and flies are attracted by this secretion and feed upon it.

The adults may be either winged or wingless, and the immature or nymphal forms grow by a series of moults.

Many aphids feed on a wide range of host plants, but others prefer either a single host or else closely related species. When winged forms are developed they may remain on their primary or first host plant, or fly off to various secondary host plants, and there give rise to fresh colonies. From these plants winged individuals of later generations may migate back to the original host plant during the autumn and early winter.



Wingless Young-bearing Female of the Green Peach Aphid.

Life History.

Some aphids deposit overwintering eggs, during autumn and early winter, in the colder districts of the State. In the spring the eggs hatch into wingless aphids, and these become the principal founders of the colonies which carry on the species throughout the year. Even in the colder districts, however, numbers of both winged and wingless females are able to survive and continue to produce living young during the winter, notwithstanding severe frosts and snow.

The first spring generation, which develops from the overwintering eggs, gives birth to living young (parthenogenetically), and these in their turn produce further living young, so that generation after generation, all the individuals of which are either winged or wingless females, continue to develop in this manner until the approach of autumn, when winged (or wingless in some species) males and wingless egg-laying females make their appearance. The mated females of this generation lay only overwintering eggs; they do not produce living young as do all the earlier generations of females.

The Green Peach Aphid.

In some seasons this aphid is a serious pest in the main peach and nectarine growing districts of the State, and to a lesser extent in the coastal areas, the main damage occurring during the spring and summer.

In the colder districts this species deposits its minute overwintering eggs on the peach trees, mainly around the bases of the buds, during May to mid-July. The eggs are often laid on other stone fruit trees, but serious infestations do not develop on these trees. The eggs hatch about the end of July or early in August. These wingless aphids remain on the trees, and when the buds burst, commence to produce enormous numbers of living young, and injury to the buds then becomes evident. In the early summer, winged migratory forms develop, and these fly off to numerous varieties of secondary host plants where they develop throughout the summer. In the late autumn they migrate back to the peach trees, where the wingless egg-laying females are developed.

The wingless adult aphids vary in colour from green to pale yellow or pink; the winged forms are green with darker markings.

CONTROL.

Tar distillate, diluted at the rate of 1 gallon to 40 gallons of water, will kill all the overwintering eggs. *This spray must be applied while the trees are completely dormant.* Only one application of this spray is necessary, provided it is thoroughly applied with a high-pressure pump (250-350 lb. per square inch). ***On no account should tar distillate sprays be applied when the buds are commencing to burst.*** The time of application of this dormant period spray varies in different districts, but on the Irrigation Area is usually from about the middle until the end of July.

Nicotine Sulphate and Soap.—This spray solution has no effect upon the eggs; but where winter control has not been undertaken or where eggs are not deposited, as in the coastal areas, this spray should be applied when the aphids become noticeable, usually during the two or three weeks preceding bud-bursting. On the Irrigation Area this period would be from about the first three weeks in August. This spray should be mixed at the rate of:—

Nicotine sulphate	1 pint.
Soft soap	3 lb.
Water	75 gallons.

The nicotine sulphate may be mixed with either lime-sulphur or Bordeaux mixture, where these fungicides are also being applied, but soap must not be used as a spreader. Calcium caseinate at the rate of 1 lb. to 100 gallons may be used instead. Semi-dormant or pale oil sprays now on the market may be mixed with lime-sulphur, but care should be exercised by growers to ensure that the right type of oil is obtained if the use of this combined spray is contemplated.

The Black Peach Aphid.

This aphid is found in most of the peach-growing districts of the State. It infests peaches, nectarines and sometimes apricots, almonds, and plums.

The mature forms, which may be either winged or wingless, are shining black and the immature forms brown. This species is not known to lay eggs.

The main damage occurs on the young shoots and leaves, and unless the aphids are checked they will cause this succulent young growth to curl and wither. Infestation is usually noticeable early in the winter, on the under-surfaces of the laterals and tops of the trees.

CONTROL.

Tar distillate (1 in 40), applied to control green peach aphid eggs, and red oil (1 in 20) will control the black peach aphid. Both these sprays must be applied *during the dormant period*.

As a delayed dormant spray, the following may be used:—

Nicotine sulphate	1 pint.
White oil emulsion	6 pints.
Water	75 gallons.

This spray mixture is specially recommended where the infestation is severe. Red oil sprays cannot be mixed with lime-sulphur and for safety an interval of several weeks should elapse between these applications.

During early spring, commencing prior to bud-burst, nicotine sulphate (1 pint to 75 gallons) may be added to either the lime-sulphur or Bordeaux mixture usually applied at the bud-swell stage. Where spraying has been neglected, or heavy infestations still persist, the nicotine sulphate and soap solution may be applied just before full blossom, and again before the leaves commence to unfold.

The Cherry Aphid.

This aphid causes the terminal shoots of the cherry trees to become dense, sticky masses of twisted leaves. The fruit and foliage below the curled masses becomes covered with "honey dew," and sooty mould develops. Serious damage is

caused to the young and succulent growth on trees which have been cut back or reworked, and young trees may also be severely injured.

The mature wingless females are glistening black and the winged forms may be dark, shiny brown or black.

This aphid, overseas, has been recorded to migrate to a few alternate, small host plants, including cress (*Lepidium* sp.) and has been found developing on watercress (*Lepidium sativum*) in this State, in a few limited areas of only some square yards in extent. It has been developed also on watercress under laboratory conditions, but secondary host plants in New South Wales cannot be considered of any real importance in the general and usually widespread infestations which occur throughout the cherry-growing districts.

All stages, including both the wingless egg-laying females and the winged males, develop on the cherry trees. The eggs, which are deposited during May and June, commence to hatch about the end of July, and hatching continues until about the middle of September. Although the winter is passed mainly in the egg stage, small colonies of these aphids, and their developing young, may be found on scattered trees throughout an orchard, even where severe frosts and falls of snow are experienced. Their presence on the trees, during winter, is usually indicated by a "pinking" and swelling of the infested buds, and premature growth of leaves and blossoms, which subsequently die back.

CONTROL.

A tar distillate spray (1 to 40) applied during July, *while the trees are completely dormant,* will kill the overwintering eggs.

Spring or "Pinking" Stage Spray.—This spray, which should be applied towards the end of September, is particularly important where the dormant period spray has not been used. It is essential that it be applied to control the aphids before they are able to shelter within the opening buds. The spray formula is:—

Nicotine sulphate	1 pint.
Soap	3 lb.
Water	75 gallons.

The "Sepalfall" or "Shuckfall" Spray.—This spray is usually applied about the end of October, the formula being similar to the "pinking" stage spray.

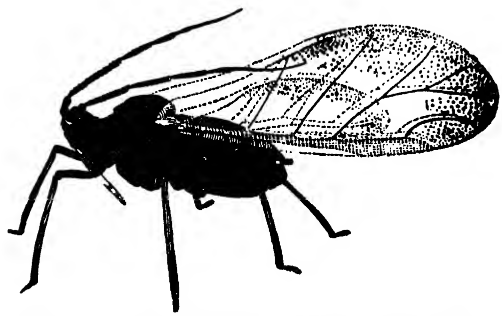
In those districts where the cherry slug (*Caliroa limacina*) is present, the arsenate of lead used to control this pest (1 lb. powder to 75 gallons of spray mixture) is most conveniently applied in combination with the above spray, as at this time the fruits are very small. Calcium caseinate (1 lb. to 75 gallons) should be used as a spreader; *soap should not be used.* If arsenate of lead is not applied at this time it is advisable, in order to avoid arsenical residues remaining on the fruit, to apply it after the fruit has been picked, in order to reduce the infestation of cherry slug in the following spring.

A third application of nicotine solution may be necessary during November in some seasons, about two weeks after the "sepalfall" spray. The nicotine may be combined with the fungicides, where these are also being applied, as in the case of the green peach aphid.

Cherry suckers should not be allowed to grow, as these almost invariably, are found to be infested with egg-laying females during May and June, and eggs deposited on suckers may serve as a source of aphid infestation later.

Citrus Aphids.

In some seasons widespread and injurious infestations of black citrus aphids occur while the growth of the trees is soft and sappy. As this growth hardens off with the approach of hot, dry weather, the infestations diminish. The critical period of aphid injury occurs, usually, from about mid-September to October, and where the aphids are abundant during the blossoming



Young-bearing Winged Female of the Black Peac Aphid, showing Sucking Beak.

and early setting period, considerable reduction of fruit-setting may occur on infested trees. The following spray is recommended:—

Nicotine sulphate	¾ pint.
Lime-sulphur	1 gallon.
Casein-lime (spreader)	1 lb.
Water to make	100 gallons.

Nicotine sulphate may also be used in combination with soap or white oil, as follows:—

Nicotine sulphate	1 pint.
Soft soap	5 lb.
(or white oil ½ gallon)	
Water to make	100 gallons.

Nicotine sulphate and Bordeaux mixture may also be used, the formula being as follows:—

Nicotine sulphate	1 pint.
White oil	½ gallon.
Bluestone	2½ lb.
Hydrated lime	2½ lb.
Water to make	100 gallons.

The Woolly Aphid.

This aphid infests apple trees and its presence is usually indicated by masses of white, woolly secretion which covers their dark-brown bodies. When parasitised they lose their woolly covering and become black or dark blue-grey.

The aphids, by feeding on the branches and twigs, cause galls and gnarled, lumpy swellings, which in old infestations may completely distort whole branches.

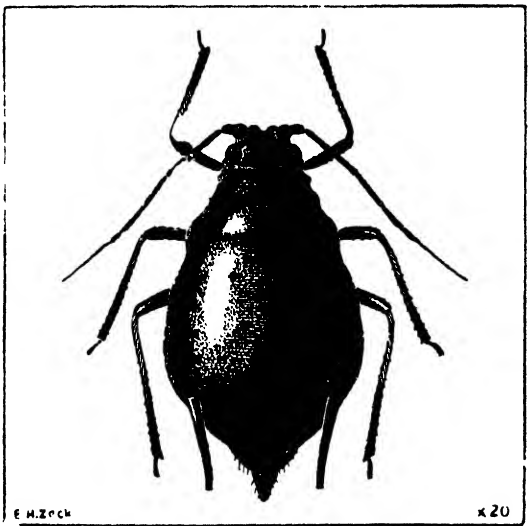
CONTROL.

These aphids are usually controlled by the introduced chalcid wasp parasite (*Aphelinus mali*) which is now well-established throughout the State. When spraying has to be resorted to, however, it may be necessary to give both winter and spring treatments.

Winter Treatment.—Miscible red oil 1 gallon to 20 gallons water. This spray which should be applied as late as possible before the buds commence to swell, will also control San Jose scale and red mite, if these are also present.

Spring Treatment.—Where it is necessary to spray in the spring, a nicotine sulphate solution (1 pint to 75 gallons water) may be used. As a spreader, either soap 3 lb. or white oil emulsion ¾ gallon may be used. If arsenate of lead is being applied for control of codling moth, at the same time, it may be combined with the nicotine sulphate and with a fungicide also if necessary, and then a calcium caseinate spreader should be used at the rate of 1 lb. to 75 gallons of spray.

Soap should not be mixed with any sprays containing lime-sulphur, Bordeaux mixture or arsenate of lead.



Wingless Young-bearing Female of the Cherry Aphid.

Cabbage Aphids.

Two species of aphids commonly attack cabbages, cauliflowers, etc., one species being green and the other slaty-grey and more or less covered with a mealy substance.

The green cabbage aphid, which is identical with the green peach aphid, is mostly found beneath the leaves, but may infest all parts of the plants.

CONTROL.

Where derris dust is applied every seven days for cabbage moth control, little development of this aphid should occur. Derris is recommended for use in intensely cultivated coastal areas. For use, the pure dust is mixed with kaolin in the following proportions:—

Derris dust	1 lb.
Kaolin	8 lb.

A 2½ per cent. nicotine dust may also be used to control this pest. Where arsenate of lead is being used on young plants, it may be combined with the nicotine dust in the following proportions:—

Lead arsenate powder	8 lb.
Hydrated lime	8 lb.
Nicotine sulphate	1 lb.

The slaty-grey aphid also infests various other crops and garden plants related to the cabbage. These aphids occur in masses, mainly on the upper surfaces of the leaves of the cabbage, but all parts of the plant including the flower stalks and buds may be severely injured.

CONTROL.

Derris dust is not effective in controlling this species of aphid, and therefore a nicotine dust, as given above, must be used.

The Green Tomato Aphid.

The large green aphids which attack tomatoes are mainly pests of spring and autumn crops. They have a wide range of host plants and are commonly found on the flower stalks of sow thistles (*Sonchus oleraceus*), Shepherd's purse (*Capsella bursa-pastoris*), tender shoots and buds of roses, cineraria, gladiolus, potatoes, etc.

CONTROL.

On tomatoes they are best controlled by spraying with nicotine sulphate in a weak (1 : 1 : 40) Bordeaux mixture, the formula being:—

Nicotine sulphate	2 fluid oz.
Bordeaux mixture (1:1:40)	5 gallons.

The Bordeaux mixture increases the efficiency of the nicotine sulphate and at this strength will not cause any spray injury. The undersurfaces of the leaves should be sprayed thoroughly.

Bean Aphids.

In most seasons bean plants become heavily infested with aphids during the spring, and if the weather is dry they may cause serious damage. The undersides of the older leaves are usually infested, but all parts of the young growth may be covered, and the plants may be attacked soon after they appear out of the ground.

Broad beans are very susceptible to attack and the young growth, flower buds and forming pods may become stunted and deformed.

The aphids most frequently found on beans are small dark-brown or black species.

CONTROL.

On beans, a nicotine and oil spray is recommended, the formula being as follows:—

Nicotine sulphate	2 fluid oz.
White oil emulsion	6½ fluid oz.
Water	4 gallons.

More than one application of spray may be necessary.

The Melon or Pumpkin Aphid.

This aphid infests most cucurbitaceous plants, but cucumbers, melons and pumpkins are particularly liable to attack. It also infests a wide variety of other plants including cosmos, dahlias, hibiscus, sunflower, thistle, etc. This species is

of very variable colour and individuals in the same colony may be yellow, yellowish-green to dark-green or almost black.

CONTROL.

On plants such as melons, cucumbers, etc., these aphids may be controlled with the nicotine and oil spray as used for bean aphids.

Carrot Aphids.

The foliage of carrots, at times, becomes severely infested with these aphids. They feed mainly on the undersides of the leaves and when abundant, the foliage curls and dries up, and becomes covered with "honey-dew."

The winged forms of this small aphid are green in colour, but the wingless forms are usually yellowish.

CONTROL.

Control of this aphid may be obtained by dusting with a 2½ per cent. nicotine dust or by spraying with a nicotine solution consisting of:—

Nicotine sulphate	1 fluid oz.
Soap	2 oz.
Water	4 gallons.

Aphids on Cultivated Ornamental Plants.

Many varieties of ornamental garden plants serve as primary or secondary hosts of a number of species of aphids, and more than one species of aphid may be found feeding in association in the same colony. Five or more species may be found infesting the rose, *viz.*, the true rose aphid (*Macrosiphum rosae*), which has both pink and green forms; the tomato aphid, which may also have both pink and green forms; the green peach aphid, and several other small, pale-greenish species. Four or five species may also be found on an individual chrysanthemum plant, probably the most injurious species of which is the chrysanthemum aphid (*Macrosiphum sanborni*), a shining reddish-brown species which often deforms the flower buds.

Ornamental pines (*Cupressus, Callitris, Thuja*), in some seasons, become heavily infested with the pine aphid (*Cinara thujafoliae*). This aphid also, at times, infests large areas of *Callitris* in the western pine forests of the State. It is a large, dark-brown, hairy species in which the cornicles are flattened, cone-like structures. It becomes most abundant during August and September.

CONTROL.

On most garden plants control may be obtained by dusting with a 2½ per cent. nicotine dust or by spraying with a nicotine sulphate and soap solution prepared according to one of the formulae already given; or by spraying with a warm soap solution made by dissolving:—

Common soap	½ lb.
Water	3 gallons.

Subterranean or Root-feeding Aphids.

Several species of root-feeding aphids have been received recently, having been recorded attacking the roots of bean plants. The roots of spinach and various other plants, including weeds and grasses, are also known to be attacked. The infested plants become stunted in growth, the leaves turn yellow and commence to wilt.

Most of these underground forms have more or less globular bodies and are covered with a white, mealy or waxy secretion which prevents them from becoming wet. They are frequently attended by ants, which may assist in their spread, as they construct galleries along or amongst the roots of the plants thus allowing the aphids easy access to fresh feeding-grounds.

No ready means of controlling these hidden feeders is known at present.

Abortion-free Herds.

THE following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion-free :—

Owner and Address.	Number in herd.	Owner and Address.	Number in herd.
A.G.H. (No. 14)	70	Killen, E. L., "Pine Park," Mumbil	223
Bathurst Experiment Farm (Ayrshires)	24	Leitch, J. F., "Tunbridge," Merriwa (Aberdeen-Angus)	72
Bauerle, P. A., Holbrook	12	McEachern, H., Tarcutta (Red Poll)	52
Bush, W., Ben Lomond	30	Martin Bros., "Narooma," Urana-road, Wagga ...	125
Callan Park Mental Hospital (Aberdeen-Angus) ...	41	Morisset Mental Hospital	81
Carrick G., "Clonlea," Central Tilba	37	Navua Ltd., Grose Wold, via Richmond (Jerseys) ...	122
Cowley, L., Redbourneberry, Singleton	56	New England Experiment Farm, Glen Innes (Jerseys)...	97
Cowra Experiment Farm (Ayrshires)	71	New England University College, Armidale	5
Department of Education—Farm Home for Boys, Gosford	36	Peel River Land and Mineral Co., Tamworth	82
Department of Education—Farm Home for Boys, Mittagong	36	Reid, G. T., "Narrangullen," Yass	171
Dixson, R. C., "Elwatan," Castle Hill	24	Robertson, D. H., Scone	82
Fairbridge Farm School, Molong	93	Rydalmere Mental Hospital, Rydalmere	57
Farrer Memorial Agricultural High School, Nemingha ..	35	Salway, A. E., Cobargo	95
Forster and Sons, Abington, Armidale (Jerseys) ...	265	Skinner, D. S., "Wywornie," Ben Lomond	38
Forster, N. L., Abington, Armidale (Aberdeen-Angus)...	188	Smith, Jas. C., Ben Lomond	83
Gladesville Mental Hospital	34	Stewart, Sir Frederick, "St. Cloud Stud" Spurway-street, Dundas	9
Grafton Experiment Farm (Aberdeen-Angus)	29	Trangie Experiment Farm, Trangie	121
Grafton Experiment Farm (Australian Illawarra Shorthorns)	93	Wagga Experiment Farm, Wagga, N.S.W.	45
Hann, O., Chatsworth Road, St. Marys	35	Walker, Jas. R., "Strathdoon," Wolseley Park ...	32
Hawkesbury Agricultural College, Richmond (Jerseys)...	108	White, F. J., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	189
Hicks, A. A., Estate, Culcairn	52	Williams, Chas., Ben Lomond	27
Hill, E. Pritchard, Bowling Alley Pt. (Jerseys) ...	96	Wilson, A. G., "Blytheswood," Exeter	62
Horderu, E. D., Cabramatta (A.I.S.)	95	Young, A. H., "Rock Lynn," Cudal (Polled Beef Shorthorns)	12
Hurlstone Agricultural High School, Glenfield	39		

MAX HENRY, Chief of Division of Animal Industry.

DON'T DELAY RAILWAY TRUCKS

THE imperative need for the quick release of goods trucks and wagons, stressed in this column of the last two issues of the *Agricultural Gazette*, is again emphasised by the Commissioner for Railways, Mr. T. J. Hartigan.

The Department of Railways has been planning and working with that object in view ever since war needs made such insistent calls on its rolling-stock for the movement of Defence equipment, whilst there was little, if any, lessening of transport demands for civilian needs.

Customers of the Railways can help the Department, in this pressing urgency, to overcome the shortage of carrying capacity by seeing that no delay whatsoever occurs to any trucks allotted to them for the loading of goods, or placed for the delivery of their incoming consignments.

Station officials are being constantly urged to speed up the "turn-round" of freight vehicles. They will be glad of the full co-operation of the public in doing so.

EVERY IDLE TRUCK MEANS SOME SLOWING-UP OF THE WAR EFFORT.

S. R. NICHOLAS,
Secretary for Railways.

NOTES CONTRIBUTED . . . . BY THE BIOLOGICAL BRANCH.

BLACK SPOT OF CITRUS.

BLACK spot is a disease affecting the rind of citrus fruits and is caused by the fungus *Phoma citricarpa* **McAlp. It occurs only in the coastal areas. All varieties are affected, but by far the greatest loss is caused to the late-hanging Valencia orange maincrop as it approaches maturity in the spring. Perhaps one of the more serious aspects of this trouble is that affected fruit fall from the tree prematurely, at the same time developing black, spreading areas which render the crop largely unsaleable. Once the disease becomes sufficiently important in an orchard to warrant the grower's concern, it can be safely assumed that from an economic viewpoint, routine preventive measures in and out of season, are more than justified.**

Young Valencia trees generally do not develop the disease until the sixth or seventh year or even later, depending on their position. Old trees usually develop the disease much more severely than younger trees. Trees on slopes facing the north, or north-west, in exposed positions, can be expected to develop the disease earlier in the spring, and with greater severity, than trees of similar age on southern or eastern slopes. On the tree itself, fruit borne on the north-western side is more severely attacked than fruit on the southern side of the tree.

Black spot is peculiar among the many diseases attacking crop plants and fruits in that a period of up to a year or more elapses between the time that infection of the young fruit occurs, and the disease develops on the maturing oranges. Hence growers who wish to safeguard their crop from this disease should protect the young fruits with fungicidal sprays for a period of about twenty weeks after blossoming.

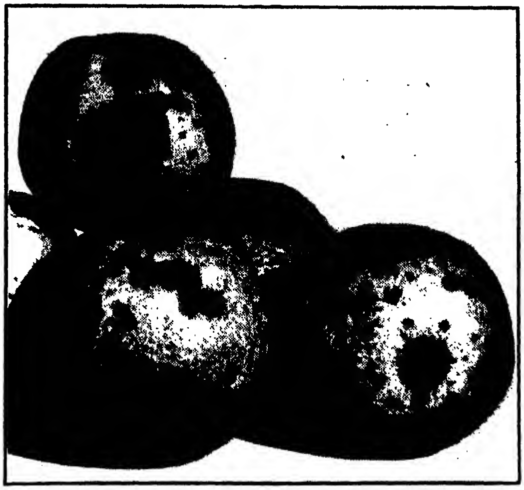
The grower has the choice of two spraying programmes for the control of this disease. Both such programmes should commence when all the blossoms on the northern side of the tree have just shed their petals.

The alternative programmes are:—

(*a*) Bordeaux mixture (2-1-80) applied four times, at "petal-fall," and five, ten and fifteen weeks later.

(*b*) Bordeaux mixture (2-1-80) applied three times, at "petal-fall," and six and twelve weeks later.

Half a gallon of white spraying oil emulsified with an equal volume of water, should be added to each 80 gallons of mixture; this will be found to increase the effectiveness of the spray as well as serving as an adhesive. Under those conditions where the Chief Entomologist recommends the use of white spraying oil in mid-December at the rate of 2 gallons to 80 gallons of water (1 in 40) for the control of white wax scale and rust mite, and



Orange Fruit Affected with Black Spot.

where such an application would coincide with the second Bordeaux spray, the two can be profitably combined in one spray (omitting, of course, the ½ gallon of white spraying oil suggested as an adhesive). Where a second oil application of 1 in 40 strength in mid-February is recommended by the Chief Entomologist for red scale

control, increased control of black spot frequently results from this additional oil spray.

The following points are suggested for careful attention:—

(1) Use only fresh hydrated lime in making Bordeaux mixture.

(2) Weigh out accurately the lime and bluestone.

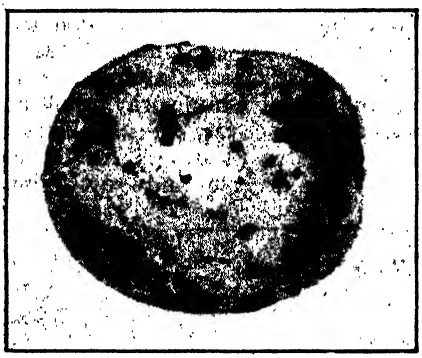
(3) Apply sufficient spray to cover the fruit adequately.

(4) Follow the programme chosen so that the spray applications go on at the correct intervals.

Seed Potatoes.

Watch for Scab and Eelworm.

THE need for large scale planting of potatoes and the resultant increased seed requirements have led in some cases to the use for seed purposes of potatoes which, under normal conditions, would not be considered suitable. Numerous examples have come under notice of the use of tubers affected with common scab and Rhizoctonia scab, and even with eelworm.



Tuber Showing Sclerotia of *Rhizoctonia solani.*

When the potato seed is affected with scab, it should be dipped in corrosive sublimate solution before sowing. This kills the parasitic organisms on the tuber, as both Rhizoctonia scab and common scab are superficial at this stage. Directions for dipping are as follow:—

Steep uncut and unsprouted seed tubers in a solution of acidulated corrosive sublimate (mercuric chloride) before planting. The treatment may be used for sprouted tubers, if necessary, but it may result in delay in subsequent sprouting.

To prepare 25 gallons of dipping solution, 4 oz. of corrosive sublimate are dissolved by stirring in 2 pints of commercial hydrochloric (muriatic) acid contained in a glass or glazed earthenware vessel. This stock solution is then diluted with water in a wooden barrel or vat, so that the final volume is 25 gallons. This quantity is sufficient to treat 1 ton of seed. Cement or metal containers should not be used. The time of treatment is 10 minutes.

With repeated use the solution slowly loses its strength, but it may be safely used for ten to fifteen dippings. Unless the seed is very dirty, if the time of treatment is then extended to 15 minutes the weakened solution will still be effective for an additional five dippings. After this it will be of uncertain composition and should be discarded.

Eelworm-affected potatoes, on the other hand, cannot be successfully treated for the elimination of the parasites, since they are embedded in the tissues of the tuber. *Potatoes affected with this disease should not on*

Large Raised Form of Common Scab.

any account be used for seed, for once introduced into the soil the parasite persists indefinitely as it is able to attack the roots of a wide variety of annuals and perennials.

It is an unfortunate fact that an increasing area of our best potato land is becoming infested with eelworm. The most serious effects are experienced on the lighter soil types. The gravity of the position is not sufficiently realised, and it should be emphasised that, in their own interests, potato growers ought to take every precaution to prevent the establishment of the disease in their land.

Eelworm infection can be recognised by the rounded, pimple-like lumps on the tubers and the small galls produced on the roots. When affected tubers are cut across, the eelworm can be seen as a small glistening body embedded in the tissue. Common scab, which sometimes slightly resembles eelworm infection, can easily be distinguished on cutting, as it is superficial and usually corky.

Eelworm-affected potatoes should be boiled before feeding to stock.

Once eelworm becomes established in the soil crop rotation with grass pasture, wheat, oats, maize, barley or sorghum should be practised, but most other crops are susceptible, and if grown will build up the numbers of eelworms in the soil.

It should be remembered that eelworm can be conveyed from infested land and spread, on farm implements, boots of workmen, and so on.

Potato Tuber showing Rounded Protuberances Produced by Eelworm Attack.

Big Bud of Tomatoes.

Insect Vector Found.

IN a most interesting paper recently to hand, Mr. A. V. Hill, of the Council for Scientific and Industrial Research, reports* the discovery of the insect vector of the virus which causes Big Bud of tomatoes. The culprit is the jassid or leaf hopper, *Thamnotetyx argentata,* which is common on a wide variety of weeds in all States of eastern Australia. Mr. Hill has also demonstrated that the Big Bud virus can affect many weeds, ornamentals, pasture plants and vegetables.

In the case of tomatoes, the symptoms of the disease are well described by the commonly used name—Big Bud. The flower calyx of affected plants enlarges to form a bladder-like structure, the stems and fruit stalks are much thickened, and as the disease progresses, an excessive number of short shoots and very small leaves are formed so that the plant becomes bunched and bushy.

In other types of plants the result of infection with this virus is the production of the well known disease "greening," the most characteristic feature being the green-

* *C.S.I.R. Journ.* 16, p. 85, May, 1943.

Big Bud of Tomatoes.
Note the bladder-like calices, very small, young leaves and thick stalks.

Advanced Stage of Big Bud.

ing and often proliferation of the floral parts, frequently associated with a bunchy habit of growth, excessive branching and small leaves. The enlargement of the calyx, which is so characteristic of affected tomatoes, does not always occur in other varieties of plants.

The disease is more serious in inland and tableland districts than on the coast, but in some years quite substantial losses may be experienced in coastal districts. In the field the main period of infection is the summer, and Mr. Hill has found that hot weather accelerates the production of symptoms in infected plants, whereas

"Greening" in Phlox caused by the Big Bud Virus.

The two heads on the left show "Greening" symptoms.
The one on the right is unaffected.

cold weather delays it. Entomologists who have studied the life history of the jassid, report that the numbers reach a maximum in the late spring, at the time when most of the annual weed host plants, on which they have been feeding, are dying off. The insects then migrate to new host plants, and any jassids which have fed on Big Bud-infected weeds will transmit the virus to the new host.

Mr. Hill found that the period between infection and the first appearance of symptoms varied from about three weeks to about five months, depending on the season of the year and on the length of the period between infection and flowering.

Zinc Deficiency of Citrus.

ZINC is one of the minor elements which have been found to be necessary in very small quantities for the healthy growth of plants. Citrus, especially, quickly show signs of trouble if sufficient zinc is not available. The symptoms are unmistakeable; the leaves are small and abnormally narrow, and a most conspicuous, whitish-yellow discolouration displaces the normal green of the leaf. At first this shows as a mottle between the main veins, but in advanced stages the whole leaf is discoloured. Seriously affected trees show considerable dieback associated with the little-leaf and mottling, and much reduction in cropping.

A Shoot of Washington Navel Orange showing Narrow, Mottled Leaves Indicative of Zinc Deficiency.

Zinc deficiency is prevalent in most citrus-growing areas in the western part of New South Wales, especially on the lighter types of soils. Zinc is best applied in the early spring as a spray of the following composition:—Zinc sulphate 10 lb., hydrated lime 5 lb., water 100 gallons. Improvement in tree health following spraying will be apparent with the next flush of growth.

A Tree at Leeton Badly Affected with Dieback as a Result of Mottle Leaf.

Soil applications of zinc sulphate cannot be recommended.

War Savings Certificates are a War-winning Investment. Buy them!

Preparations for the Honey Season.

THE exceptionally heavy show of buds on the main honey-producing flora gives promise of a heavy yield of honey, and bee-farmers, expecting much from the season we are now entering, are eager at this time to establish their hives in strength before the heavy flows come on. They are anxious too, to make up, by artificial increase, any losses which have occurred, so as to utilise the spare material and brood-combs held in store.

The earlier the brood-combs are placed under care of the bees the better, as wax-moths become more troublesome with the approach of warm weather. There is less anxiety in regard to the valuable combs when they are in the care of bees than when kept under fumigation.

Both Colony Strength and Increase are Required.

It appears somewhat anomalous to state that the aim of the bee-farmer should be the establishment of strength in his colonies to enable them to be properly prepared for production of honey, and, at the same time, artificial increase to replace losses or to build up the apiaries. However, the moderate increase usually sufficient for the purpose is practical, and in most instances can be carried out with benefit together with the establishment of the colonies in strength during spring.

Drawing a nucleus colony or two from each populous hive, well-established with brood, will relieve the congestion of young bees which influences the development of tendency to swarming. It is a better policy, therefore, to provide relief in this way, than risk the bees finding their own way out of the problem by swarming. Particularly is this true during this current season, when it is desirable to have the apiaries as fully re-established as possible before the commencement of the main flow. Later on, with the advent of heavy honey-flows, the colonies are disposed towards reducing brood-rearing, and under such conditions the making of increase will become difficult, and also result in lowering the honey-producing capacity of the colonies from which nuclei colonies are drawn.

Bee-farmers Must Raise Queens.

The ability to raise queen bees for use in his own apiary, will be of particular benefit to the bee-farmer this season. It may be anticipated that it will not be possible for queen bee-breeders to fill all orders for early queens, and to make the most of favourable spring conditions for increase, in which the provision of queen bees for the new colonies is an essential part, the bee-farmer must arrange to provide most of his own requirements.

There is no other phase of bee-farming practice in which the average bee-farmer is more backward than queen-rearing. Probably many have attempted the operation previously without gaining very good results—and we may assume that such attempts were made at the wrong time. As a result they depend on the queen-breeder for all requirements. To secure young, well-bred queen bees from a breeder where replacement of cull stocks in the apiary is required is an excellent plan, but in times such as at present, when so much building up is necessary, and breeders are not in a position to fill all requirements, the bee-farmer who is not self-reliant may miss a golden opportunity to re-establish or build up his apiaries during the most favourable period.

A Simplified Method.

For those who do not care to venture upon the raising of queens by methods involving the transfer of young larvae to prepared cells, simpler practices may be employed to serve the purpose. First of all, it is necessary to observe that sufficient supplies of nectar and pollen are available from the fields to ensure of progressive brood-rearing being maintained within the hives, and fairly settled spring weather should be awaited. Then good queen cells may be raised as follows:—Select a progressive, medium strength colony, not necessarily a well-bred one, and remove the queen, placing her aside in a nucleus hive with a comb of her brood well covered with bees together with a comb of honey. Then remove all combs containing unsealed brood, substituting a couple of frames of sealed brood, and make sure that the now queenless colony has a supply of unsealed honey and some freshly stored pollen. To secure the best results in cell building and the feeding of royal larvae, the colony must be compact and in a somewhat overcrowded condition on the combs occupied in the hive, and a division board may be employed to give full effect to this purpose.

The next procedure is to cut out a strip of brood comb containing one row of cells with eggs in them, from the brood nest of the best Italian colony from which it is desired to breed the young queen bees. Then shave to the mid-rib the cells on the opposite side, and fasten this strip to the underside of a top bar of a frame. A thin stream of melted wax, not over-hot, run down each side will make a firm attachment, or the strip may even be gummed on. To allow ample room for the cells to be built out conveniently, leave one egg out of every four along the row, destroying surplus eggs with a match stick or such like. There is no need to make a rush job of attaching the strip of comb containing eggs, as the eggs are not as susceptible to outside conditions as young larvae, particularly if they are standing upright in the cells which is a guide to their

A Good Honey Flow Prospect.

The examination is being made by Apiary Inspector Shallard.

freshness. The writer has raised queens from fresh eggs which have been over-night in the mail.

The bar is then placed in the prepared cell-building hive between the two frames of sealed brood, where it is left until the completed queen cells are ready for removal in twelve days' time for distribution to nuclei colonies. A good, vigorous colony should start and complete upwards of twenty-five cells, and two bars of the improvised queen cells to make up the desired number may be inserted if required.

Where queen bees are to be raised by methods involving the transfer of young larvae to prepared cells, it is recommended that the new scheme evolved at Hawkesbury Agricultural College, and described in "Beekeeping Hints" in January, 1943, be adopted.

Making-up the Nuclei Colonies.

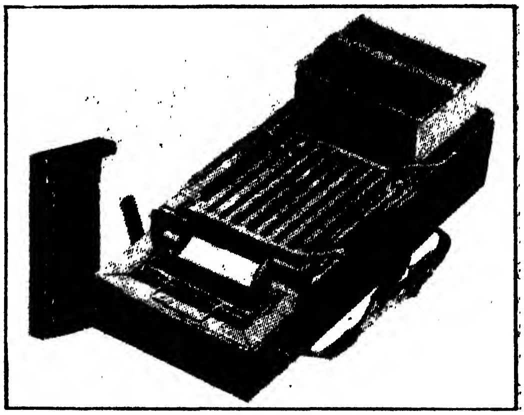
In making up nuclei colonies it is sufficient to provide, at first, one empty comb against the wall of the hive, one good comb of brood well covered with bees, and a third comb, in the outside position, containing a supply of honey. Three or four colonies should be made up at a time, and then each one given a ripe queen cell placed point downward immediately over the top fringe of brood.

The bees will need to be screened in for a couple of days, by the insertion in the hive entrances of full width strips of wire screen, or if screen material is not available—it is difficult to secure these days—the blocking up of the entrances with grass will act as a reasonably good alternative method. During very warm weather the additional precaution of shading the hives may be worthwhile.

The Hot Top Cappings Melter.

AT Hawkesbury Agricultural College during the past season we have had the opportunity of testing the Australian-manufactured hot top cappings melter, and very successful results were obtained. The principle involved, melting the wax without heating the honey from cappings, is ideal. The accompanying illustration shows the construction of the melter. The cappings fall on to a sloped bottom, warmed just sufficiently at one end by steam to make the wax pieces float on top where, as uncapping proceeds, they rise and contact a steam-heated grid. Then by a proper setting of a honey outlet elbow, the honey is drawn off from underneath where it has not been in contact with any direct heating apparatus, whilst the melted wax drains from the top into a wax mould.

With this melter, the risk of overheating honey, a cause of some concern with other types of reducers, is obviated. The hot top is specially adaptable for the larger producer employing a central honey house, or where steam is made available on mobile outfits. The manufacturers, Messrs. Pender Bros.



The Hot Top Cappings Melter.

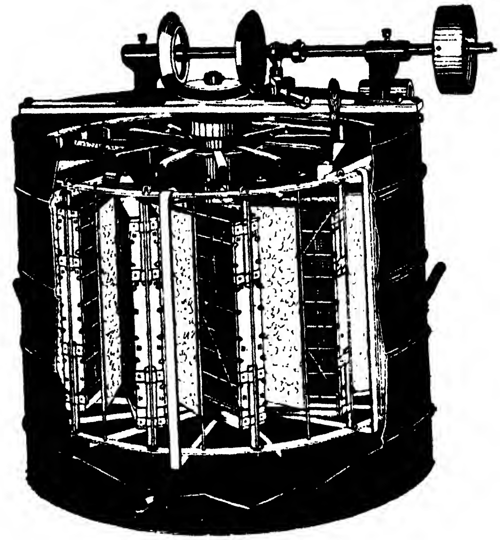
Ltd., of West Maitland, advise that the exhaust from a steam knife provides sufficient heat. At the College, however, we have a two-way steam cock from which the volume of steam is controlled, and separate connections lead to the knife and the wax-melting grid.

Value of Electric Power.

DURING a recent visit to the Clarence River district, the writer spent a very interesting time at the apiary of Mr. J. J. Green, on Palmer's Island, and was given a good demonstration of the value of electric power supplied to the producer from the Clarence scheme. In his central honey house Mr. Green employs electric power to drive his honey extractor and saw bench, and has electric heating units to heat the water in a large cappings reducer. The honey extractor is the new Australian semi-radial (as

illustrated); Mr. Green is very pleased with its performance in dealing with a crop from his 700 colonies of bees.

Some of our old hands may remember the time some fifty odd years ago, when Mr. Green's father won first prize in a contest for the best apiary of over 100 hives of bees, open to competitors throughout the State, the competition being arranged by the Department of Agriculture in co-operation with the Apiarists' Association. The cash prize was supplemented by a certificate issued by the Department, and the certificate still finds a prominent place in the Green home, and is highly treasured. This family has always selected the Ligurian (leather-coloured) Italian bees, but this type is becoming more and more difficult to obtain of late years. Even in Italy there is a noticeable tendency towards the production of brighter-coloured bees.



The New Australian Semi-radial Extractor.

Brucellosis-free Herd Scheme (Swine).

LIST OF ACCREDITED HERDS.

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Adams, J. P., " Melton," Daysdale.
Bathurst Experiment Farm, Bathurst
Boardman, C., Camden.
Campbell, D., Hillangrove, " Wamberal," via Gosford.
Chapman, G. E. and Son, " Illabo Park," Alectown.
Cocks, F. D., " Condalarra," Gooloogong.
Cowra Experiment Farm, Cowra.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., " Glengar," Capertee.
Farrer Memorial Agricultural High School, Nemingha.
Fisher, J. R., Furlong's Stud Farm, Richmond-road, Blacktown.
Foley, Mrs. E., Bligh Stud Piggery, Water Lane, Rouse Hill.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Holland, A. L., Argonne, Tubbul.
Hurlstone Agricultural High School, Glenfield.
Maybin, N. C., Towac, Orange.
McBride, J. L., " Belvedere," Camden.
McCaughey Memorial Agricultural High School, Yanco.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Government Agricultural Training Farm, Scheyville.
Shirley, G. F., " Camelot," Penrith.
Smith, J. M., Eulo Glen, Urana.
Stewart, Sir Frederick, " St. Cloud," Dundas.
Wagga Experiment Farm, Wagga.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., " Gwandalan," Grenfell.
Wilson, A. G., Blytheswood, Exeter.
Wollongbar Experiment Farm, Wollongbar.

Herds Other than Registered Stud Herds.

Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Croft, H. M., " Salisbury Court," Uralla.
Glen Innes Prison Camp, Glen Innes.
Gosford Farm Home for Boys, Gosford.
Goulburn Reformatory, Goulburn.
Kenmore Mental Hospital, Kenmore, via Goulburn.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital, Orange.
Parramatta Gaol, Parramatta.
Peat and Milson Islands Mental Hospital, Hawkesbury River
Pollak, V., Marata, Harrow Road, Glenfield.
Smith, C. W. J., " Norbiton," Canadian Lead.
Stockton Mental Hospital, Stockton.
Yanco Agricultural High School

Improving Dairying Efficiency

To Supply Vital Foodstuffs.*

G. McGILLIVRAY, Chief, Division of Dairying.

THE suggestion sometimes heard these days that the dairying industry generally is not efficient, and has not pulled its weight in supplying high priority foodstuffs, is not substantiated by the facts. On the contrary, New South Wales' dairy farmers have done a very good job, despite manpower and many other difficulties. This is shown by the fact that in the year 1942-43, they supplied cream to make approximately 45,300 tons of butter, compared to 38,000 tons the previous year. Admittedly, 1941-42 was an adverse season, but in the main butter-producing areas—on the Far North Coast—the 1942-43 production was approximately equal to that of the good year, 1939-40. In some other areas, a greater proportion of milk than usual was diverted to the wholemilk and milk products trade.

There are, of course, many dairy farmers who could do much to improve their practices; in fact, a higher standard of farming could be achieved on the majority of dairy farms. Most farmers are aware of this, but cannot carry out desired improvements because of lack of finance. The Government has now realised this position, as it did in the last war, and it is to be hoped that, with the return of peace, it will not be forgotten that a prosperous and contented condition in the industry is essential to efficient production.

The three principal means by which dairy production can be improved are:—

1. Better feeding of the stock, following improvement of the pastures, and the growing and conservation of fodder crops.
2. Maintenance and/or restoration of soil fertility.
3. Improvement of the dairy herds.

The great seasonal variation in production is evidence of the value of good feeding in relation to yields, and good breeding methods are often handicapped by poor feeding.

Better Pastures Managed Better.

The improvement of pastures is the first consideration in providing better feed, and farmers should contact the Department of Agriculture to obtain the recommendations for their own particular district. The efficient management of these pastures is essential to achieve the maximum benefit from them. Subdivision is a wise precaution. Allow of, say, fifteen cows per acre, although the layout of the land should be taken into consideration as well as the size of the herd. By this improvement and the practice of rotational grazing, the farmer always has his cows on the best pastures. Topdressing, where it has been found successful, the use of grass harrows, and the establishment of pastures by means of "cover" crops, are practices well worth investigation to see if they can be carried out with benefit to the productivity of the farm.

Crops for grazing or soiling, grain, silage, or hay, can be grown with advantage on most dairy farms. Where this is not possible, it is suggested that the co-operative factory arrange for crops to be grown in other districts. Fodder conservation is, of course, a natural corollary of fodder production, and in times of shortage of pasture or crop, hand feeding of reserves of fodder should be commenced early.

In all this farm work, consideration should be given to the maintenance of the fertility of the soil.

Better Stock Handled Better.

The method of handling stock has a great influence on the productive capacity of the herd. In the past, in many instances the growing heifer has been left to fend for herself—and the Department was not without blame for its recommendations in this matter. This method of treating growing stock is now known to be wrong, and it is recognised that growth requires more feed than milk.

(*Continued on page* 443.)

* Notes of an address given at the 1943 Annual State Conference of the Agricultural Bureau.

FEEDS and FEEDING NOTES.

Contributed by
The Division of Animal Industry.

MEAT MEAL RATIONING.

LAST month's notes contained some preliminary information on the rationing of meat meal, meat and bone meal, blood meal and similar products and mixtures containing these materials. The temporary scheme then outlined is now being replaced by a control scheme which will obviate applying for permits for each purchase.

The broad details of this scheme are as follows:—

All retailers of feeding meals are being supplied by the Department with quantities of a combined declaration and permit form. All pig and poultry owners requiring regular supplies of feeding meals must obtain one of these forms from their usual supplier, complete same, and return it to their supplier for certification that they are *bona-fide* pig or poultry farmers. The declaration will be held by the Department of Agriculture and details checked, and the permit may be held either by the farmer, in which case it must be presented each time a purchase is made, or it may be held by the farmer's usual retailer, so that it may be consulted when an order is received.

There will be limits to the amounts of meals that may be sold, the limits depending on the number and type of stock to be fed and the length of time that it is intended the supplies should last, but in any case where the stockowner considers that the ration is insufficient he should state his case in writing to this Department, where it will be given full consideration.

A consumer may alter his supplier. If the alteration is permanent, the permit must be altered accordingly and this Department advised, but if the alteration is only temporary, the temporary supplier will endorse the permit with date and amount of materials supplied.

Where supplies of feeding meals are required for sheep or cattle, the intending purchaser must make application, as at present, to this Department, stating name and address, number and type of stock to be fed, amount and type of materials required, feed, pasture and crops available, time which supplies should last, and name of supplier. A permit, if granted, will then be forwarded to the applicant.

Permits will not be necessary for purchase of feeds which contain meat meal, etc., but which contain less than 35 per cent. minimum crude protein. Thus, permits will not be required for purchase of battery mashes, laying mashes, growing mashes, calf meals, sheep nuts, etc., which do not exceed this limit.

Conservation of Supplies is Essential.

In order that a more rigorous control scheme, with additional burden on consumers and suppliers, will not be necessary, all consumers are urgently requested to keep in mind at all times the necessity for conserving supplies of these materials, and should carefully check the percentages and amounts of feeding meals in their rations.

For example, if each poultry farmer in New South Wales used 4 oz. less of meat meal per day, another ½ million head of poultry could be fed on the amount saved.

Since the inauguration of the temporary control system, many instances of waste of meat meal, due largely to lack of care, have come under notice. For example, men who were of the opinion that they were only using, say, 8 per cent. of meat meal in their mash, were found, after investigating their figures of meat meal consumed, to be feeding as high as 15 per cent. Such wastage of valuable foodstuff must not be allowed to continue, and the means of avoiding such wastage, apart from the issue of permits to approved users, is increased attention to the following points—

1.—Ascertain the minimum level of meat meal or meat and bone meal, etc., that will maintain production or growth rates. (Last month's notes contained information on this point.)

2.—*Weigh out* accurately each day's requirements. Most of the wastage from excessive feeding probably results from inaccurate estimates of amounts of meat meal by using volume instead of weight as a measure.

3.—Use proportionately less of high protein content meat meal as against the lower protein content meat and bone meals, and proprietary protein mixtures.

Insufficiency of Protein the Real Problem.

The shortage of these meals in this and, more particularly, other States, is the main reason why rationing is necessary to ensure that the limited supplies are diverted to stock to which they are essential, and from uses for which they are not essential and wasteful.

However, the rationing of meat meal is only one effect of a problem—an insufficiency of protein for stock feeding purposes—which has been growing more and more acute. As is well known, abattoir by-products such as meat meal, meat and bone meal, etc., and oil meals, such as linseed meal, peanut meal, coconut meal, etc., are rich in protein, containing 20 to 80 per cent. as against only about 10 per cent. in grains and 5 per cent. in oaten or wheaten chaff. The effect of the war has been to increase the demands for, and decrease the supplies of, these materials, so that, in effect, there is national deficiency of protein-rich feeds for stock.

The decrease in supplies and increase in demand for the meals has been brought about by many factors, such as decreased production of bran and pollard (which, although not rich in protein, contain more than the grains), Japanese occupation of islands which were sources of oil meals, shipping difficulties in bringing oil meals from other countries, and increased demand for production from stock such as pigs and poultry, which must, for maximum production, be supplied with protein concentrates.

Grow More Protein-rich Fodder.

How are we to overcome this problem? Britain has been faced with practically the same situation and is overcoming it by a method which we must adopt, namely, increased production of protein on the farm. Naturally this protein is not in the form of meat meals or oil meals, but protein-rich fodder, such as well-managed improved pastures, clovers, lucerne, young cereal crops, such as oats and wheat, and combinations of cereal crops and protein-rich crops such as maize and cow-peas. Hays and silages must also be made from these materials, special attention being given to the points which must be considered in conserving protein-rich fodder. Details of the production and conservation of these crops are obtainable from the Department and its Agricultural Instructors.

With this increase in production of protein on the farm, not only will there be a reduction in the requirements of protein concentrates, but also increased production and increased economy of production from the nation's stock. For instance, with increased production and conservation of protein-rich fodder crops on dairy farms, winter production would be maintained at a higher level, and the necessity for oil meals, such as linseed meal, greatly decreased. By the provision of protein-rich grazing crops for pigs, the amounts of protein concentrate, such as meat meal, necessary to produce a baconer, can be practically halved. The meat meals and oil meals saved from these stock can then be used for feeding of stock where seasonal conditions have rendered impossible "home production of protein" or for stock, such as poultry, which, for maximum production, need protein concentrates.

The following figures give some information as to the relative protein contents of some common feeds. So that the water content of green fodders will not mask their food value, the protein figures below are based on the dry matter in the feeds. Thus, though green oats in the field has only 4 lb. of crude protein to 100 lb. of green feed due to its high water content, it has about 20 lb. per 100 of dry matter. Note the richness in protein of certain types of crops, such as lucerne, clovers and improved pasture.

Feeds.	Pounds of crude protein in 100 lb. of dry food.
Meat meal	50–60
Meat and bone meal	45
Peanut meal	49
Linseed meal	30
Coconut meal	20
Bran and pollard	15
Young improved pasture, lucerne, clovers, vetches, peas, cereal crops (6 to 8 inches in height), and hay and silage made from these materials	15–25
Mature pasture, mature cereal crops, maize, sorghum and millet fodder, cereal grains, and hay silage and and meals made from these materials	5–10

These figures do not take into account the quality or digestibility of the protein, but, even on these figures, one cannot fail to realise that the protein of oil meals and meat meals can, for many stock, be at least partially replaced by paying more attention to the production of protein-rich fodders on the farm.

The Effects of Underfeeding Cows.

On Quantity and Quality of Milk.

THE effect of underfeeding on milk production is a subject which might be thought too well known to be mentioned, and milk might be thought to be milk, no matter how the cows are fed. However, there are several points in connection with underfeeding, milk production, and human nutrition which should be more deeply considered.

Milk as a human food has gained its rightful reputation as a protective food because of its high content of protein, minerals, and vitamins, especially vitamin A. Underfeeding, that is, supplying less food than is required for maintenance and production of milk without loss in weight, whilst it does not influence to any consistent extent the butter fat or mineral content of milk, can reduce the amount of solids-not-fat, mainly the protein, by up to 12 per cent., according to recent New Zealand work, with a consequent reduction in food value. (This drop in protein content must also have an effect on the cheese producing capacity of milk.)

The richness of milk in vitamin A, one of the main "protective" factors in milk, is directly related to the amount of green feed fed to the cows. The drop in the colour of butter when pasture dries off is due to the fall in vitamin A content, so that butter, milk or cheese produced from poor feed have not the protective value of products from cows receiving an abundant supply of green feed.

Underfeeding always results in a drop in production whether the cow is comparatively newly calved or in the latter stages of lactation. A temporary period of underfeeding when the cow is newly calved is not followed by such a drop as occurs when the underfeeding takes place in the latter half of lactation, and is usually followed by a return to practically full production when feeding is again normal. On the other hand a drop in production caused by underfeeding in the latter half of the lactation period cannot usually be rectified to any extent by return to normal feeding.

The points for guidance from these facts are obvious:—

(*a*) For production of the highest quantity of milk of the highest food value, cows must be given sufficient feed during the whole lactation period to cover all their nutritive requirements and must be given a liberal amount of vitamin A rich foodstuff such as green pasture, fodder crops, well conserved green hay (such as lucerne hay) or well conserved silage.

(*b*) If cattle are allowed to drop in production, especially if in the latter half of lactation, due to a fall in pasture quality, full advantage cannot be taken of any subsequent improvement in pasture quality.

(*c*) To eliminate this factor of temporary underfeeding limiting subsequent production, cattle should be given adequate supplementary feeding as soon as there is any indication that poor feed is causing production to drop. Better still, supplementary feeding should be instituted before the drop takes place. However, too often supplementary feeding is "too little, too late."

Silage for Horses.

SILAGE is well known and held in high regard as a cattle feed, but it is not widely used for the feeding of horses. However, it can be successfully used for this purpose.

Only silage of first quality, free from mould or decomposition, should be used for horses, as they appear to be more susceptible to poisoning from such forage than cattle, and it should not be used as the sole roughage for horses, but to replace about half the hay or chaff, 3 lb. of silage replacing 1 lb. of chaff.

Horses should be brought on to silage gradually, and because it is unpalatable for some horses, trouble may be experienced during the first few days in accustoming horses to it. Up to 20 lb. per day may be fed. Owing to its bulky nature it is more suited for brood mares and idle horses than those in work.

Current Feeding Costs.

Feed.	Starch Unit Value per 100 lb.	Protein Unit Value per 100 lb.	Cost.	Cost per Starch Unit.	Cost per Protein Unit.	Remarks.
ROUGHAGES.						
Lucerne hay or chaff (good, sound).	35–45 (av. quality 40).	10	£9 long ton	2·4d.	...	Roughages continue to be dearer, as sources of food matter, than concentrates.
Oaten chaff	40	3	£7 long ton	1·9d.	...	
Wheaten chaff ...	40	3	£8 long ton	2·1d.	...	
Oaten hay	33	3	£6 long ton	2d.	...	
Wheaten hay	33	3				
STARCHY CONCENTRATES.						
Wheat	72	8	3s. 6½d. per bushel in truck lots—bagged (Sydney basis).	0·1d.	...	Wheat, with barley, the cheapest starchy feeds available.
Wheatmeal	72	8	£7–£7 5s. short ton ..	1·2d.	...	....
Maize	78	8	7s. bushel	1·9d.	...	Maize too expensive for use as stock food.
Maize meal	78	8	£14 short ton	2·2d.	...	....
Barley	71	7	3s. 1d. bushel	1d.	...	Barley as cheap as wheat.
Barley meal	71	7	£7–£7 10s. short ton ...	1·2d.	...	....
Oats	62	8	3s. bushel	1·5d.	...	Oats and bran should only be used as leavening feeds. Pollard good buying when available.
Crushed oats	62	8	3s. 8d. per 40 lb. ...	1·8d.	...	
Pollard	66	10	£6 short ton	1·1d.	...	
Bran	56	10	£6 short ton	1·3d.	...	
PROTEIN CONCENTRATES.						
Linseed meal	72	25	£9 10s.–£10 10s. short ton.	1·6d.-1·7d.	4·5d.-5d.	Fair supplies.
Peanut meal	78	43	£6 10s. short ton ...	1·1d.	1·8d.	Supplies very short.
Coconut meal	76	15	£7 short ton	1·1d.	5·1d.	Limited supplies
Meat meal	80	55	£10 10s. short ton ...	1·6d.	2·3d.	Limited supplies.
Blood meal	...	68	£14 short ton	...	2·5d.	Supplies available.

MINERAL SUPPLEMENTS.

Mineral.	*Cost.*	*Supplies.*
Ground calcium carbonate (limestone)—a calcium supplement.	34s. per ton in bags, (truck lots).	Supplies available.
Bone meal (a calcium and phosphorus supplement)...	£14 10s. per ton, F.O.R.	Supplies moderate.
Bone flour (a calcium and phosphorus supplement)...	£11 15s. per ton, F.O.R.	Supplies available.
Shell grit	30s. per ton (bulk) ...	Supplies available.

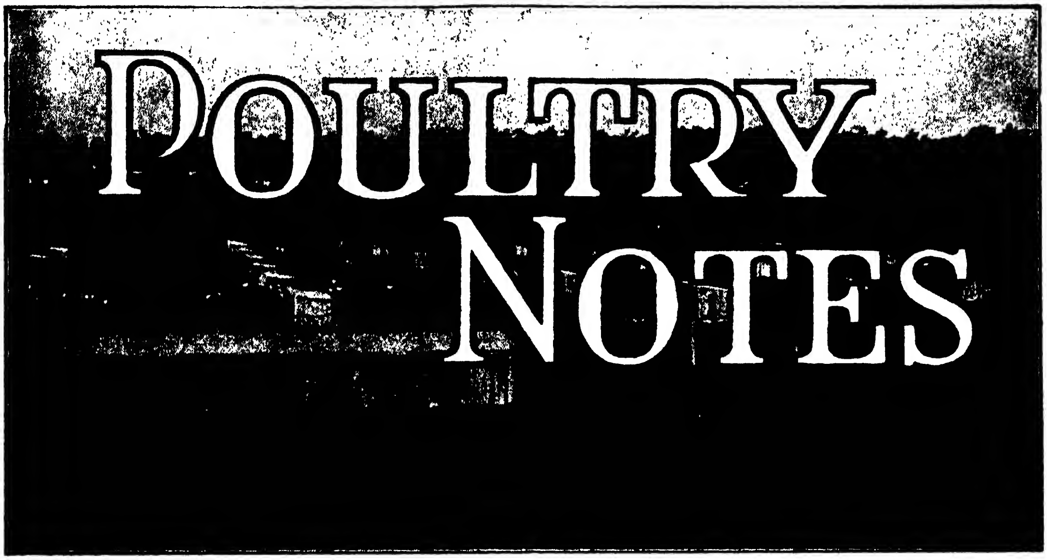
Co-operation as a Way of Life.

"CIRCUMSTANCES over which we have little control are forcing upon us consideration of plans for a 'New Order,' or a better way of life. Some folks appear to think that this can be brought about by Act of Parliament, or in some mysterious way, without conscious effort on their part—the other fellow will somehow do the work and the giving. If we expect to get a bigger share from the common pool of goods and services, there is only one way to get it, that is, by making a bigger contribution to the pool ourselves.

"Probably no great movement has had less advertising than the co-operative system. Yet it has exercised a strong attraction to those who have learned to know it, and has inspired much devotion in its service. It is gradually working out a new principle in the distribution of the world's wealth, not so much on the ownership of capital, or the work done, but on human needs.

"The movement is becoming more firmly established, as the common people are educated to its value as a means of improving their economic and social position. As the result of valuable experience over the years, it can be claimed that it works and grows and thrives. It fosters human personality, and promotes mutual aid among its members. Its motive power is mutual service—not profit—and morality in business is its watchword. Its business runs into thousands of millions, throughout the world, but it has never made a millionaire. It has millions of members, but has never caused a drop of blood to be shed."—Mr. A. HEATH, Advisory Councillor of the Agricultural Bureau, at the State Conference.

War Gossip is Dangerous. Guard Your Tongue.



THE MATTER OF CULLING.

ALTHOUGH it is somewhat early to discuss the actual technique of culling hens, the extent to which culling is to be practised this year is a subject which requires consideration in the light of the prospective egg position and the need for maximum production. It is quite apparent that there will be a greater shortage of eggs next autumn than last, but the volume of production can to some extent be influenced by the rate of culling between now and February.

In view of this the aim this season should be to reduce culling to a minimum, consistent with making provision for the accommodation of pullets and eliminating any birds which are not likely to show a profit over cost of feeding during the summer months. Whether or not there are many birds which should be culled can be decided by keeping a record of production for each pen, and noting whether any flock falls below normal expectations. The accompanying table showing the average production which might be expected from hens in their first and second laying seasons, will serve as a guide:

In the event of a sudden fall in production after October it should first be ascertained whether there has been any fault in management which would account for the reduction, and if so, this should be remedied. Under these circumstances culling should be deferred, unless the birds have commenced to moult, in which case it is not likely that many in their second year would be worth holding. If production is consistently lower than seasonal expectations over a period of several weeks and is not attributable to some factor in management, a start should be made to cull out those which are not laying.

Month.	First Year.		Second Year.	
	Eggs per bird per month.	Eggs per 100 birds per day.	Eggs per bird per month.	Eggs per 100 birds per day.
May	7	23	1	3
June	9	30	3	10
July	14	45	6	19
August	18	58	14	45
September	20	67	18	60
October	20	65	18	58
November	18	60	16	53
December	17	55	15	48
January	15	48	11	35
February	13	46	9	32
March	9	30	5	16
April	8	27	4	13
	14 doz.		10 doz.	

Procedure to Adopt in Culling.

When culling it is not necessary to catch all the hens in a pen, as this would involve a good deal of time and disturb the birds unduly. All that is required is to pick out those which are showing any shrivelling of the comb, dullness of the face, or coarseness. Upon catching these birds they should be handled to ascertain if the pelvic bones are closed and the abdomen contracted.

Head of Poor Layer (White Leghorn)

Showing characteristics denoting coarseness—
1. Skull deep above the eyes.
2. Skull wide across the top.
3. Sunken eye with overhanging brow.
4. Feathery face.
5. Comb and wattles coarse in texture.

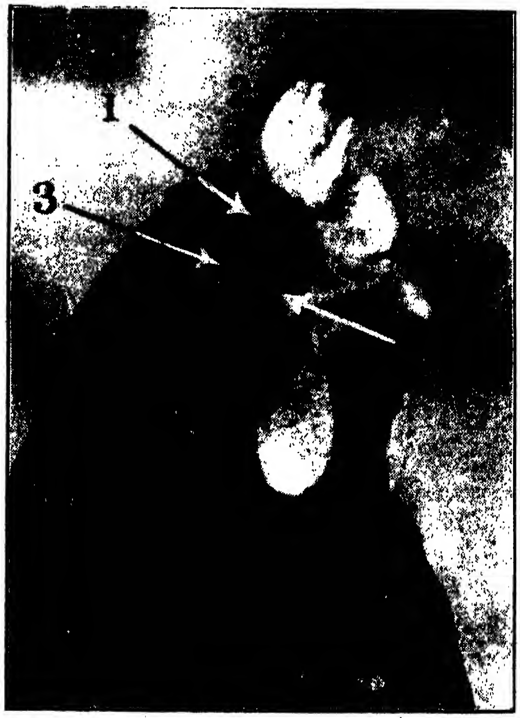
These are definite indications that the birds are not laying, but it is necessary to make allowance, in the case of heavy breeds, for any birds which may have just been returned to the pens after being broody, as they would be in the same condition. If any doubt exists on this point it is better to put such hens in a separate pen for a week and check them over again.

As far as first-year hens are concerned only a limited amount of culling should be necessary, and most of those which require to be culled should be eliminated by February, which is the beginning of the normal moulting season.

In the case of second-year hens, however, a gradual culling should be carried out up to about the middle of April, when any which are not moulting should pay to keep until the summer.

Indications of a Poor Layer.

Among all flocks there is a percentage of hens which become "coarse," and which it will not pay to keep after the flush laying season. This applies particularly to the heavy breeds and is one reason why light breeds are more popular on commercial farms.



Head of Poor Layer (Heavy Breed).
1. Skull deep above eyes.
2. Skull wide across top.
3. Sunken eye with overhanging brow.
4. Feathery face.

Some of the main characteristics denoting coarseness are as follow:—

1. Skull wide across the top and deep above the eyes, with overhanging brows.
2. Eyes sunken and small.
3. Comb large and coarse in texture.
4. Face wrinkled and feathery.

5. Skin of abdomen leathery and "ridgy."

6. Pelvic bones very thick and covered with gristle.

7. General appearance inactive.

8. Birds unduly fat and heavy.

Occasionally birds showing outward indications of coarseness are found, upon handling, to be in laying condition, but in the majority of cases such birds should be culled.

Supplies of Shell Grit for Poultry.

Standard Adopted by Department of War Organisation of Industry.

WAR conditions having threatened the New South Wales poultry industry with a shortage of shell-grit, steps are being taken by the Department of War Organisation of Industry to maintain supplies.

That Department points out that although there is need for stringent economy in the allocation of fuel and tyres and railway freightage, the Goverment proposes to make available enough to maintain the essential supplies of grit. It is suggested that difficulties due to a shortage of transport facilities and manpower may be overcome by eliminating waste. Some samples of shell-grit have been found to contain as much as 50 per cent. of stones, whole shell and sand; 30 per cent. of such waste is by no means uncommon.

The New South Wales Standard Specification.

A standard specification for grit has therefore been adopted. It is as follows:-

1. SCOPE.—This specification covers the physical and chemical requirements of shell-grit for poultry.

2. TYPES OF SHELL.—The grit shall be of oyster or mixed shells, and shall contain not more than 15 per cent. by weight of blue barnacle or other highly pigmented blue shell.

3. QUALITY OF GRIT.—The grit shall be clean and sweet, unburned, and free from contamination by foreign organic matter.

4. FINENESS.—The grit shall be of such a degree of fineness that it shall pass through a screen of 5/16 inch square apertures, and 90 per cent. shall be retained on a screen of 1/12 inch square apertures.

5. CHEMICAL COMPOSITION.—The grit shall contain not less than 93 per cent. of calcium carbonate, and not more than 5 per cent. of mineral matter insoluble in hydrochloric acid (10 per cent. strength).

Grit may be either bagged or in bulk. Special chicken grit will be deemed to conform with requirements if offered or sold as chicken grit, and if it contains not less than 93 per cent. of calcium carbonate—in other words, is free from excessive sand.

Poultry farmers, War Agricultural Committees, Officers of the Department of Agriculture and grit producers and distributors are invited to inform the Department of War Organisation of Industry about sub-standard grit, or other aspects of the sub-standard grit, or other aspects of the trade with which the Department may be able to assist.

The Rationing of Meat Meals.

DETAILS of the scheme whereby meat meals, meat and bone meals and similar products and proprietary protein concentrates containing these meals are being rationed, are set out in Feeds and Feeding Notes on page 437 of this issue.

Improving Dairying Efficiency.

(Continued from page 436.)

Then it is necessary for the dairy farmer to know more of animal husbandry. He should study the history and habits of the breed of cattle on his farm. A man who is a good judge of cattle is an asset to his industry. This knowledge, combined with the use of pure-bred bulls of high production strain, the testing of each cow for production, and the rearing of heifers only from the best cows in the herd, will do much to increase yields.

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
		1943.
W. J. Frizelle, Rosenstein Dairy, Inverell ...	76	1 Sept.
Wollongbar Experiment Farm...	112	4 "
Navua Ltd., Grose Wold, via Richmond (Jerseys)	118	4 "
A. E. Liggins, "St. Leger Dairy," Kuring-gai Chase Road, Turramurra North	52	7 "
W. Budden, "Hunter View," Kayuga Road, Muswellbrook	18	7 "
Australian Missionary College, Cooranbong ...	113	8 "
Kahlua Pastoral Co., "Kahlua," Coolac ...	314	10 "
T. McLane, Wellingrove, Inverell	33	10 "
W. Willis, "Rosedale," Inverell	17	13 "
E. L. Killen, "Pine Park," Mumbil	252	23 "
A. Hannaford, Braidwood	20	26 "
W. S. Grant, Braidwood	20	26 "
J. McKenzie, Inverell	35	28 "
Farrer Memorial Agricultural High School, Nemingha	39	29 "
The William Thompson Masonic School, Baulkham Hills	50	29 "
Department of Education, Gosford Farm Home	40	29 "
Berry Training Farm, Berry	162	31 "
A. L. Logue, "Thornbro," Muswellbrook ...	46	13 Oct
Woomargama Estate	207	22 "
W. J. Stephenson, "Hill View," Fig Tree ...	57	1 Nov.
Barnardo Farm School, Mowbray Park ...	75	4 "
State Penitentiary, Long Bay	10	9 Dec.
		1944.
Limond Bros., Morisset	60	13 Jan.
J. M. Turnbull, "Pastime," Kayuga Road, Muswellbrook	75	15 "
E. R. Fishlock, Fig Tree, Wollongong ...	38	18 "
St. Ignatius College, Riverview	25	27 "
Department of Education, Yanco Agricultural High School	69	6 Feb.
Riverina Welfare Farm, Yanco	74	6 "
St. John's College, Armidale	30	8 "
A. C. O'Dea, Perry Street, Dundas	28	14 "
McGarvie Smith Animal Health Farm, Liverpool	55	22 "
C. Wilton, Bligh Street, Muswellbrook ...	75	3 Mar.
N. L. Forster, Abington, Armidale (Aberdeen Angus)	188	12 "
Forster and Sons, Abington, Armidale (Jerseys)	87	13 "
Lunacy Department, Morisset Mental Hospital	84	15 "
Wagga Experiment Farm (Jerseys)	81	20 "
Trangie Experiment Farm, Trangie	121	20 "
New England University College, Armidale ...	12	31 "
St. Michael's Orphanage, Baulkham Hills ...	18	31 "
W. H. Long, Brodie's Plains, Inverell ...	44	13 April.
A. G. Wilson, "Blytheswood," Exeter ...	62	14 "
H. F. Bradley, "Nardoo," Ashford Road, Inverell	35	15 "

Owner and Address.	Number Tested.	Expiry Date.
		1944.
Grafton Experiment Farm	191	15 April.
Lunacy Department, Callan Park Mental Hospital	26	1 May.
T. J. Wilks, "Oaks Farm," Muswellbrook ...	37	5 June.
E. J. Cottell "Kapunda," Rob Roy, Inverell	50	23 "
L. W. Campbell, "Dunmallard," Fern Hill Road, Inverell	32	23 "
E. D. Rankins, "Oakwood," Inverell ...	23	23 "
J. O. McGufficke, "Lovely Bank," Rob Roy, Inverell	20	23 "
J. H. Lott, "Bellevue," Rob Roy, Inverell ...	23	23 "
Cowra Experiment Farm	66	24 "
New England Experiment Farm, Glen Innes (Jerseys)	73	27 "
G. T. Reid, "Narrengullen," Yass	274	3 July.
Farm Home for Boys, Mittagong	49	9 "
Lunacy Department, Rydalmere Mental Hospital	50	19 "
St. Vincent's Boys' Home. Westmead ...	26	20 "
Lidcombe State Hospital and Home	106	30 "
Hurlstone Agricultural High School, Glenfield	37	31 "
Ehsman Bros., Inverell	28	13 Aug
Peel River Land and Mineral Co., Tamworth (Beef Shorthorns)	82	28 "
Fairbridge Farm School, Molong	92	31 "
Bathurst Experiment Farm	24	9 Oct.
Lunacy Department, Gladesville Mental Hospital	34	23 Nov.
Hawkesbury Agricultural College, Richmond (Jerseys)	110	18 Dec.
		1945.
The Sydney Church of England Grammar School, Moss Vale	51	5 Feb.
Koyong School, Moss Vale	2	8 "
New England Girls' Grammar School, Armidale	30	11 "
W. W. Martin, "Narooma," Urana Road, Wagga	143	22 "
R. C. Dixon, Elwatan, Castle Hill (Jerseys) ...	31	29 Mar.
Lunacy Department, Parramatta Mental Hospital	66	30 "
A. E. Stace, Taylor Street, Armidale	38	1 April.
A. D. Frater, King's Plain Road, Inverell ...	123	12 "
F. C. Harcombe, Hillcrest Farm, Warialda Road, Inverell	38	13 "
Parker Bros., Hampton Court Dairy, Inverell	180	17 "
H. F. White, Bald Blair, Guyra (Aberdeen Angus)	186	30 "
Emu Plains Prison Farm	108	7 May.
Sir F. H. Stewart, Dundas	12	5 June.
S. E. E. Cohen, Auburn Vale Road, Inverell...	33	22 "
B. N. Coote, Auburn Vale Road, Inverell ...	79	22 "
A. N. De Fraine, Reservoir Hill, Inverell ...	28	22 "

Tubercle-free Areas.

The following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis :—

Bombala Area.
Inverell Area.
Braidwood Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

MAX HENRY, Chief of Division of Animal Industry.

The Germination of Prickly-pear Seed.

SOME interesting results have recently been obtained from germination tests of prickly pear seed several years old. The seeds had been collected by Mr. H. T. Nicholas, Officer-in-Charge, Prickly Pear Station, Scone, and results were as follows :—

	1938. per cent.	1943. per cent.
Opuntia inermis, collected in old emu dung at Pilliga in 1937	50	58
O. compressa, collected in the Singleton district in 1938	84	83
Opuntia sp., collected from ripe fruit at Gravesend prior to 1930	No test.	11

AMY MYERS, Seeds Officer.

The Agricultural Gazette.

OCTOBER, 1943.

EDITORIAL.

Fodder Conservation.

AUSTRALIA'S dependence for a total war effort on an adequate and stable food production programme is being stressed constantly. The promise by the Governor-General, Lord Gowrie, in his speech at the opening of the Commonwealth Parliament, of an early review of the relative importance of efforts on the food and fighting fronts, should be heartening to primary producers whose industries became unduly depressed because of the paramount urgency of other demands during the period when Australia was threatened with invasion.

Adequacy of conserved fodder is a factor which can guarantee not only an increase in many lines of primary production, but also can safeguard against those seasonal fluctuations which make advance planning uncertain, if not impossible. We cannot afford to allow the outcome of the war to be determined by nature.

The Federal and State Governments are intent upon removing all obstacles at present operating against farmers who desire to build up fodder reserves. Shortages of manpower, finance and transport are among the more important obstacles, to which must be added lack of appreciation of the importance of fodder conservation on the part of some farmers and slowness to take advantage of the assistance afforded them by the Government.

The New South Wales Dairy Mechanisation Scheme to date has not been fully availed of. Under that scheme district pools of machinery can be purchased on the most liberal financial terms. The co-operative use of these machines not only helps to solve farm labour problems, but also ensures the growing of adequate feeding-stuffs for immediate use, and for storing. Nor should the conservation of surplus pastures—as hay or silage—be overlooked.

In addition to the Dairy Mechanisation Scheme, there has also been set up in New South Wales, at the instigation of the Commonwealth, a Fodder Conservation Committee. That committee consists of Dr. R. J. Noble (New South Wales Under Secretary and Director for Agriculture), Mr. C. K. Jacka (Treasury), Mr. J. B. Timbs (Dairy Factory Managers' Association), Mr. A. Sullivan (New South Wales Rural Reconstruction Board), and Mr. F. W. Bulcock (Director-General of Agriculture).

Among the responsibilities of this committee are the operation and co-ordination of any fodder conservation schemes set up in New South Wales, and also the allocation of advances for fodder conservation from funds advanced by the Commonwealth Government (£100,000) and provided by New South Wales out of State revenue (£50,000). The scale of advances suggested is as follows:—Silage, 17s. 6d. per ton; cereal hay, 25s. per ton; lucerne hay, 30s. per ton loose and 35s. per ton baled.

Any national expenditure on fodder conservation in the interest of Australia's war effort is doubly well spent. Far from being wasteful (like so many wartime outgoings), it is destined to pay handsome peacetime as well as wartime dividends—both to the individual and to the nation—for a permanent and efficient agriculture is largely dependent on livestock farming.

Transport Problems are Being Closely Watched.

RUBBER and fuel shortages, and the difficulty of maintaining motor vehicles in repair constitute a major problem for the food producers of the nation. Total solution of the rural road transport problem would appear to be almost beyond the capacity of human endeavour and ingenuity while ever the demands of war and the crippling hold of the Japanese on rubber and fuel supplies remain as at present.

However, if sympathetic understanding of the farmers' transport problem and a determination to co-operate to the fullest extent can lighten the full impact of these adverse factors, then primary producers can rest assured that the Department of Road Transport is behind them to a man. Unmistakable evidence of that Department's aim to serve the producer and the nation was manifested at a conference of administrative and district officers held in Sydney last month, and presided over by the Administrator of Road Transport (Mr. A. A. Shoebridge).

Conference discussed practical difficulties both from the farmer's and the transport officer's points of view, and examined suggestions (based on practical experience) for the smoother working of the difficult task with which transport rationalisation officers are faced—in short, of making one unit of fuel or rubber, or one vehicle, do the job of several.

Discussion left no doubt on two points of particular interest to primary producers. Firstly, that transport officers (field and administrative) value fully the close co-operation afforded them by War Agricultural Committees in the rationalisation of transport; and, secondly, that they appreciate that their job is to restrict the irrational, not the rational, use of road transport. After all, the main aim is to safeguard against any produce being left to waste in the field.

Re-arrangement in Department of Agriculture.

Economics and Marketing Divisions Amalgamated.

THE Minister for Agriculture and Forests (Hon. W. F. Dunn, M.L.A.) has announced that the Public Service Board has approved of the amalgamation of the Divisions of Marketing and of Agricultural Economics of the Department of Agriculture, with Dr. H. J. Hynes in charge, as Acting Chief of the combined Divisions. The amalgamation was decided upon to ensure the closest collaboration between the officers engaged in these two closely allied spheres of activity, thereby making for a maximum of efficiency.

Dr. Hynes, who was formerly Chief Biologist of the Department, has had a brilliant career. He was first appointed to the Department in July, 1919, as a Scientific Cadet. After graduating as B.Sc.Agr. with honours in 1922, he was appointed to the position of Assistant Biologist, and by March, 1940, had progressed to the position of Chief Biologist. In March, 1923, Dr. Hynes was awarded the Walter and Eliza Hall Agricultural Research Fellowship, and after post-graduate study and research at Sydney and Minnesota (U.S.A.) Universities he graduated as M.Sc. at the latter in 1925. In 1936 he obtained the degree of D.Sc.Agr. at Sydney University.

In addition to his outstanding scientific career, Dr. Hynes has had valuable administrative experience which makes him particularly well fitted, not only to administer the routine work of the combined divisions, but also to supervise research into problems associated with marketing and agricultural economics.

The Growing of . . . .

TURNIPS AND SWEDES FOR FODDER

On the Northern Tableland.

J. B. NOONAN, H.D.A., Agricultural Instructor.

THE use of turnips and swedes for provision of winter fodder on the tablelands of New South Wales has increased rapidly during the past few years until several thousand acres are now sown annually. Turnips have proved to be excellent for grazing and to have some marked advantages over cereal crops. They are not nearly as soil exhausting as oats and other cereals, and thus are to be preferred as a fodder crop for the light soils, particularly the poorer granite country of New England and other tableland districts. Hardly any soil that can be cultivated is too poor to produce fair crops if good methods are used, and thus turnips should find a place on all properties in these areas where stock are grazed. Seeding is usually cheap, and the crop is grown before required, thus eliminating the exacting pasture management required with cereals. Turnips and swedes will stand without appreciable deterioration until late winter or early spring, and the heavy yields possible under good farming methods give enormous carrying capacity, while very little digestive trouble has been experienced with the crop.

Practically every grower can quote excellent results from the grazing of sheep on turnips and swedes, but two instances on the property of Mr. A. E. Bigg, Thalgarah, Armidale, will illustrate the value of the crop for the Northern Tablelands. In both cases the sheep had access to natural pasture and cereal chaff in self feeders, the consumption of chaff being 1 lb. per head each week.

In January, 1939, Mr. Bigg sowed two paddocks with Champion Purple Top swedes, and grazing began in June. One area of 13 acres was stocked to 2,300 lambs for eight weeks and the paddock was then cultivated lightly. The remnants of the crop fed 1,400 ewes for a fortnight.

The second paddock, of 15 acres, was grazed to 940 sheep, of which 700 were aged ewes to be sold off. Their market value at commencement of grazing was 2s. 6d. per head, but in ten weeks all were fat and realised 10s. 6d. per head. The best were ready for slaughter in six weeks.

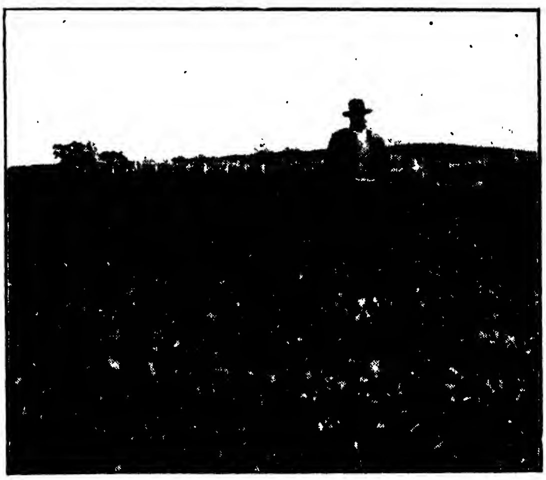
Turnips and swedes are not difficult crops to grow, but there are four essentials if success is to be expected:—

1. Early and thorough preparation of the soil.
2. Sowing during the correct period.
3. Avoidance of over seeding and thick crops.
4. Correct management, especially when feeding off.

Suitable Soil and Preparation.

Turnips and swedes have been grown on all types of land but they do better on light land, and excellent results have been obtained on granite. Generally heavy soils and land that is not well drained should be avoided.

Thorough preparation of the soil is of paramount importance and can only be achieved when ploughing is carried out several months before sowing. If possible the ploughing should be completed in the winter, but at least a four months' fallow should be allowed. The initial working should be thorough, and the object of subsequent cultivations should be the making of a firm, moist, weed-free seed-bed.



A Crop of Purple Top White Globe Turnips.

The small seed requires a firm seed-bed, and this can only be secured by fallowing, during which the rains will firm the land down satisfactorily. Growers usually endeavour to "short cut" rain by use of a roller, but the effect is not very satisfactory. The necessity of a firm seed-bed should rule out a late second ploughing or deep working, except where the fallow has got out of control and either weeds are bad, or the land has set badly. A trial conducted in the Uralla district in 1940 showed that working of the land 3 inches deep just before seeding reduced the yield 30 per cent. The main result was the poorer strike, but the roots were also smaller.

Early preparation of the land is the only assurance that the soil will be ready for sowing during the correct period.

Time of Sowing.

This depends on the variety and the time that the subsequent crop will be required. Swedes are slower in maturity than turnips, which do not keep well and thus have a restricted use.

A Root of Purple Top White Globe.

The sowing period ranges from November to March, both inclusive. Swedes sown in November and December will provide autumn fodder, but seeding for winter crops should be made in January. It is not recommended that swedes be sown later than January, except on the lower and warmer parts of the district such as Tenterfield.

Field and table varieties may be sown from January onwards, and for best results seeding should be completed in February, though later planting can be made on the lower parts of the Tableland. These turnips should not be sown earlier than January, as they do not keep as well as the swedes.

Average Northern Tableland rainfall is good in December and January, light in February, good in March, and very light in April-May. It is thus easy to see the reason for the times of sowing recommended.

Rates and Method of Sowing.

In the majority of cases crops are sown too heavily, but much of the trouble is due to the variation in vitality of different lines of seed. Over-seeding is a common cause of failure, and thin crops are to be preferred as a rule. As a guide, the number of plants per square yard should not exceed sixteen where block seedings (broadcast by hand or through machines) are followed.

Growers are urged to use good seed, and with this, where soil conditions are favourable, a seeding rate of 1 lb. per acre is ample. Frequently satisfactory stands are secured from sowings of ¾ lb. Heavy seeding rates should only be used where low grade seed has to be sown, or soil conditions are adverse, and in this latter case it is only a chance crop at the best. The rates mentioned are for block sowings, and ½ lb. or less is sufficient where row sowings are made with spacing of 15 to 24 inches between the rows.

Where the land is weedy the turnips and swedes should be sown in rows to allow of inter-cultivation; a row spacing of 24 inches will permit of horse work. Row sowing may be made with a Planet Junior vegetable seeder, a single row maize dropper (through the fertiliser) or with a combine or drill with the runs not required blocked up.

On clean land, block sowing is advised, and the best method is the use of such machines as a combine or direct drop fertiliser distributor. A light harrow or bush is drawn behind the machine to cover the seed. Seeding may be made also by hand, the seed being mixed with fertiliser or sand or hand broadcasting machines used.

The important points in sowing are:—

1. Seed should never be sown deeply; a suitable depth is ½ to 1 inch. Where the seed is broadcasted on the surface, the covering must be light, and very light harrows or a bush may be used to secure this result.

2. The seed should be uniformly distributed over the area at the correct rate of sowing.

3. Where seed is mixed with fertiliser for sowing, care must be exercised, otherwise the germination capacity may be reduced. Mix the seed and fertiliser as required for sowing, and discard the practice of mixing a day's supply ahead. Storms or other contingencies may hold up sowing, and seed so mixed is likely to be damaged.

Shallow sowing usually requires a fall of rain to secure a germination, and this is a good reason for making early seedings. On well fallowed land, even light falls will suffice and crop success is then practically assured, but light falls generally mean disaster on poorly prepared land.

Fertiliser.

Swedes and turnips are mostly grown on light country of moderate to low fertility, and thus it is very desirable to use fertiliser on the crop. Superphosphate is the only fertiliser recommended, and generally the rate of 1 cwt. per acre is quite sufficient. However, where soils are very responsive to phosphate higher dressings may be applied.

Utilisation of Turnips.

Turnips and swedes are excellent feed for all classes of large stock, but are principally used for sheep grazing on the tablelands and in other similar districts. As a sheep fodder for autumn and winter they are hardly excelled, and wider use of this crop will assist greatly in overcoming the "winter drought" of tableland districts.

Although nearly 90 per cent. of the turnip is water, the dry matter is extremely digestible and accounts for the splendid results obtained in feeding of the crop. It also explains why there is such a small amount of digestive trouble with stock fed on turnips; most growers state that the only complaint is the choking of an odd sheep.

In grazing, the sheep clean up the tops first, and then consume the roots. When the latter are eaten down to ground level, it is advisable to cultivate the paddock and this exposes the remnants of the roots so that they can be secured easily by sheep. Large paddocks should not be grazed as a whole, as this will result in waste. It is wise to fence off with temporary fencing—electric fencing is very useful for this—and eat these areas out before pushing on to a fresh patch.

The crop may be used for fattening sheep or just for maintenance of the flock over the winter. The latter is usually the case, owing to lack of sufficient fodder, and in such instances the sheep are grazed for a short period each day or couple of days. For this purpose a good turnip crop will give an enormous carrying capacity. When fattening sheep, the full and continuous use of the grazing is allowed, as maximum feeding is desired.

Cattle are rarely grazed on turnips and swedes, but they are usually fed to milking stock, after pulling and slicing with the old English machines. The roots provide an excellent succulent base for the ration of milking cows, but being low in protein require supplementing with such protein-rich fodders as lucerne chaff or linseed meal. About 10 lb. of the roots are approximately equal in food value to 25 lb. chaff or 1 lb. of grain. Milk tainting will be largely avoided if the ration is fed during or just after milking. Field turnips are much less liable to tainting than swedes.

Roots of Swedes and Turnips
Left.—Purple Top Swede.
Centre.—Purple Top White Globe Table Turnip
Right.—Mammoth Purple Top Field Turnip.

Turnips are an excellent fodder for pigs and the crop should find a place on all piggeries owing to the ease and cheapness of production. As with milking cattle, turnips used for pigs require supplementing

with some protein-rich feed, such as meat meal or dairy by-products.

In feeding turnips where both swedes and the other types are grown, the keeping quality of the roots must be considered. Field and table types are not good keepers, whereas swedes will remain fresh much longer. Thus swedes should be kept for the late winter feeding.

Varieties.

Three groups of turnips are grown for stock feed on the Northern Tablelands and the principal varieties are:—

1. *Swedes.*—Champion Purple Top, American Purple Top, Craig's Purple Top.

2. *Field Turnips.*—Mammoth Purple Top, Aberdeen Purple Top and Pomeranian White Globe.

3. *Table Turnips.*—Purple Top White Globe and White Stone.

The swedes are the most widely grown on account of their greater palatability and better keeping qualities. They are also slightly more nutritious than the field and table turnips, but have the disadvantage of being much more susceptible to aphid attack. Swedes provide heavy crops and as they root fairly deeply, sheep can bite away at them without difficulty. The only variety grown to any extent normally is Champion Purple Top.

Field and table varieties are very similar as far as fodder and grazing characters are concerned. They are earlier maturing than swedes and thus can be sown later, and they are less palatable, though they are usually readily eaten when other turnips are not available. Turnips root to a shallow depth only and in dry seasons have the tendency to push out of the soil with grazing. The loose roots present difficulties in consumption and sometimes result in loss of fodder. Field varieties are far less liable to aphid damage, but have poorer keeping quality than swedes.

All field and table varieties yield heavily, and usually will out-yield swedes considerably under similar conditions. Most of them have white flesh which grows pithy early; however, even then stock eat the roots. The most consistent yielders are Mammoth Purple Top and Purple Top White Globe. Aberdeen Purple Top is a favoured variety as it has a yellow solid flesh which has a greatly reduced tendency towards pithiness.

While it is inevitable that swedes will remain the main turnip for the bulk of seedings, there is a place on most properties for field or table types. Use of both swedes and field varietes will allow of a much longer and safer sowing period and a greater provision of fodder. The seeding and feeding range would then work out as follows:—

November-December.—Sow swedes for autumn and early winter feed.

January.—Sow swedes for feeding mid- and late winter, particularly late winter.

February-March.—Sow field or table turnips for mid-winter fodder.

It is particularly recommended that field or table varieties be used for sowing after January in all but the lower parts of the Northern Tablelands, instead of taking the risk with a late planting of swedes.

Aphid Infestation.

Aphids are the worst and the only real pest of swedes and turnips on the tablelands, and they infest most crops every season, though to a greatly varying extent. The aphids usually make their appearance after a dry spell, and the weather of April-May is generally very favourable for their rapid multiplication. In a growing crop the pest may be checked by a good fall of rain, but this does not usually occur in the late autumn.

Observations over the past five seasons have clearly demonstrated that damage from aphid infestation is most apparent under the following conditions:—

1. In crops that lack vigorous growth and are struggling.

2. In the thickest part of any crop. This is usually the first and hardest damaged, and conversely the thinnest portion may be scarcely touched.

3. In swedes which are more susceptible than field or table turnips.

These observations stress the necessity for following the recommendations given earlier in this article in regard to preparation of soil and sowing, namely, early and thorough soil preparation, sowing early (swedes not later than January as a general rule), and absolute avoidance of over

(*Continued on page 462.*)

Farm Tenancy in New South Wales.

The Agricultural Holdings Act, 1941, and its Application.

(*Concluded from page* 410.)

A. W. S. MOODIE, H.D.A., H.D.D., Senior Agrostologist.

THIS is the concluding section of an article which commenced in the May, 1943, issue, and which is intended to give to parties to farm tenancy and sharefarming agreements in New South Wales, a non-technical explanation of the provisions of the Agricultural Holdings Act, 1941, which was proclaimed on 1st July last.

The several instalments should be read in conjunction with an article on "The Procedure for Settling Disputes under the Agricultural Holdings Act," by J. R. Butler, B.A., LL.B., Legal Officer of the Department, which appeared in the August issue.

How the Act will Function.

Two basic principles are recognised to be fundamental to the creation of an improved landlord-tenant system. These are:—

(*a*) The need for stability and uniformity in the system of tenant farming and sharefarming.

(*b*) The urgent need for evolving a system of tenant farming that will function in the direction of a constructive, rather than an exploitative, form of agriculture.

It is fully realised that under the existing system relationships between many landlords and tenants are harmonious, and that some tenants are not restricted in their efforts to follow a high standard of husbandry. Many far-sighted landlords encourage and assist tenants and sharefarmers to effect improvements, and any disagreements are settled by friendly discussion or by the employment of valuers or arbitrators. The Act will not interfere with or change this system to any appreciable degree, unless a dispute under the Agricultural Holdings Act arises.

The Act is designed to protect numerous tenants and sharefarmers who are denied many of those things to which they should be entitled, such as security of tenure, and compensation for improvements. Clauses in contracts of tenancy purporting to limit or take away the tenant's rights to compensation for improvements created by the tenant under the Act are now definitely null and void.

Claims for Compensation.

It can be anticipated that during the period before they become familiar with the requirements of the Act, farmers will experience a few difficulties in presenting claims for compensation.

A tenant may have two sets of rights to compensation at the termination of his tenancy. One set may arise from the terms of his tenancy agreement, and the other set is conferred upon him by the Agricultural Holdings Act, 1941. An example of a right to compensation under the terms of the tenancy agreement would be one relating to cultivations or tillages. The Act does not confer any right to compensation for this item, but under the tenancy agreement the landlord may have agreed to compensate the tenant for land cultivated and prepared for cropping. The claim is really in respect of the value of the labour which the out-going tenant has put into the land, and of which the incoming tenant will receive the benefit. The valuation would be on a cost basis, and the tenant should maintain a record of the various cultivation operations carried out.

The Act does not confer the right to compensation for "standing" crops at the termination of tenancy; the tenant should safeguard his interests in this respect by arranging for an appropriate clause to be included in the tenancy agreement. There is one exception to this rule. Compensation under the Act would be payable for a "standing" crop grown expressly for the purposes of green manure (see Part II of the First Schedule).

Before embarking on a new tenancy agreement the tenant or sharefarmer should become familiar with those rights to compensation conferred by the Act. Should they fail to cover all contingencies for a particular type of tenancy, additional arrangements can be included in the contract of tenancy.

When making claims for compensation under the Act evidence in support of such claims should be presented. An outgoing tenant claiming compensation for the unexhausted value of fertilisers should present accounts from the company which supplied the fertiliser, and any claim in respect of feeding stuffs purchased and consumed on the holding should be supported by similar evidence.

The right to claim compensation for the unexhausted value of artificial manures arises from the fact that the effect of an application of such fertiliser may last for more than one crop. The outgoing tenant is, therefore, given the right to compensation for that portion of the fertiliser not utilised by the crop with which or to which it was applied. An illustration of the manner in which this principle applies in practice is provided by the procedure followed in England. In the case of superphosphate the tenant is allowed two-thirds of the cost of the manure as its unexhausted value after one crop, one-third after two crops, and one-sixth after three crops. When used on grassland two-thirds of the value is allowed

after the first year, one-third after the second year, and one-sixth after the third year. Compensation for the unexhausted value of fertilisers such as sulphate of ammonia, nitrate of soda or dried blood, is not allowed under English conditions. Should the tenant use large amounts of such fertilisers in his last year of tenancy, he may indeed incur a penalty because of their exhausting effects on the soil.

The above figures are quoted to illustrate the meaning of the term "compensation for the unexhausted value of fertilisers," but it must not be implied that the same procedure will be followed in New South Wales. Factors to be considered in assessing the unexhausted value of a fertiliser are: the suitability of the fertiliser for the soil, the nature of the soil, the cropping programme pursued, and the climatic conditions.

In the settlement of claims for compensation for increased or decreased value of the holding during the course of a tenancy, a record of the condition of the holding must be made under the Act. To facilitate and support claims for most of the improvements listed in Parts I and II of the First Schedule to the Act, an inventory of the farm is almost essential. The inventory should be prepared when the term of tenancy commences, or should one be in existence it should be checked by the landlord and tenant or their representatives. An inventory will remove many causes for dispute when claims for compensation are being determined.

The importance of maintaining a complete set of records covering farm operations cannot be too strongly emphasised. A claim for compensation for improved permanent pasture, for example, would be strengthened by evidence showing the date of sowing and treatments subsequent to sowing. Similar records dealing with crops and their disposal would likewise be of assistance in dealing with claims for compensation.

Need to Observe Legal Procedure.

The tenant and sharefarmer must be familiar with their obligations under the Act in regard to the procedure to be followed in order to qualify for compensation for various items. Examples will illustrate this point. Assuming that all other requirements have been fulfilled, the tenant in order to obtain compensation for disturbance must, not less than one month before the termination of his tenancy, give notice in writing to the landlord of his intention to claim compensation for disturbance. He must also give the landlord a reasonable opportunity of making a valuation of any goods, implements, fixtures, produce or stock to be sold. Likewise, before proceeding with any of those improvements listed in Parts I and II of the First Schedule to the Act, the tenant must conform to the procedure laid down, or forfeit his rights to compensation. The tenant's right to remove machinery, fencing, engines, or other fixtures and buildings erected by him and for which he is not entitled to compensation under the Act is dependent upon his giving to the landlord one month's notice in writing of his intention.

The need to observe the proper legal procedure in regard to all matters arising under the Act is strongly emphasised. No matter how strong the moral claim of the tenant or landlord may be in regard to the matter in question or dispute, he will be unable to pursue his case unless he has followed the proper procedure.

Finance for Improvements under the Act.

A very desirable aspect of well-regulated farm tenancies is the opportunity created for combining the resources of landlord and tenant in a programme of farm improvement. The Act provides that tenants and sharefarmers may carry out certain improvements, and the question of responsibility for financing such improvements naturally arises. If the provisions of the Act relating to those improvements listed in Parts I, II and III are studied carefully, it will be noted that the landlord may assume the responsibility for improvements included in Parts I and II, or he may prefer to allow the tenant to carry out and finance such work. On the other hand, the tenant must be prepared to finance any of the improvements listed in Part III, which he is permitted to carry out without reference to the landlord. The inclusion of fertilisers under this heading has caused apprehension in a few districts where the soils do not respond to superphosphate.

Landlords claim that they should not be responsible for payment of compensation for the use of a material which they know to be valueless under their conditions, and which they claim may be used lavishly in the last year of tenancy with a view to claiming compensation. Such an attitude reveals a complete lack of understanding of the Act.

The tenant would probably be aware that an agricultural committee composed of practical men would scarcely be likely to award compensation for the use of fertilisers on soils known to be unresponsive. Even where soils do respond the tenant would not receive as compensation the full value of the fertiliser used. In any event, it would be competent for a committee to decide that the quantity of fertiliser used was excessive and to make an award accordingly.

Co-operation between Landlord and Tenant.

The measure of success attained by the Agricultural Holdings Act in smoothing out many of the difficulties encountered by tenants, sharefarmers, and landlords, and in creating a new tenancy structure, will depend largely on the co-operative efforts of the principal parties concerned.

The land provides a common bond of interest between landlord and tenant. It is to the interests of both parties that farm policy should be planned in the direction of securing maximum returns without exploiting the principal asset—the soil. At the present time the outlook of both parties to the landlord-tenant relationship is often entirely wrong, and there is no more evidence of co-operative effort than would occur between the landlord and tenant of a city dwelling where the parties may never make personal contact during the entire term of the tenancy.

Certain personal qualities are essential in both landlord and tenant if the partnership is to succeed. In the tenant the landlord should look for honesty of purpose; a thorough knowledge of all the farming enterprises to be included in the farm business; ability and energy to work; the proper attitude toward the adoption of new

methods and practices; pride and interest in farm life, and a willingness to take a personal interest in the farm, apart from the desire to achieve adequate financial returns. In the landlord the tenant should look for similar qualities plus willingness to co-operate; understanding of farm problems; good judgment in regard to farm improvements and the extent to which it is economical to invest in improvements; appreciation of the tenant's viewpoint regarding the adoption of improved practices as soon as their merit is established. If both parties are imbued with the same spirit in regard to these major points, effective co-operation will be easy to attain.

The first consideration of the landlord should be to safeguard his greatest asset, the fertility of the soil. If possible, this should be improved, and by securing the co-operation of the tenant in the adoption of a high standard of farming this object may be readily achieved. Next, it should be the aim of the landlord to increase the value of the farm as a whole, especially in the directions of improving the buildings, equipment, and fences to facilitate efficient operation. The residence must not be overlooked, as living amenities of a high standard will attract efficient tenants.

The tenant should be encouraged by the landlord to discuss farm operations prior to the commencement of the tenancy, and during its continuance, with the object of securing, not only ready co-operation in implementing plans for cropping and soil management generally, but interest in the property and its improvement. Whilst a certain standard of husbandry may be demanded by the landlord, maximum results are more likely to follow co-operation than coercion.

If the tenant desires to effect improvements of a reasonable and desirable character, and is willing to supply the necessary capital, it is to the interest of the landlord to encourage such an attitude and to aid the tenant in every way. The fact that the tenant has a legal claim to compensation for the unexhausted value of such improvements at the termination of his tenancy should not provoke an antagonistic attitude. Whilst the tenant may reap the immediate rewards, the landlord's asset is being improved.

The first essential in a tenant is to have the proper attitude towards the farm of which he is the temporary occupant. Having no vested interest in the land his natural tendency is to exploit it to his own advantage. The best tenant is one who will farm the land as an owner-operator, by adopting methods to conserve soil fertility and to improve the property generally. Ready co-operation by the landlord can usually secure this attitude in a progressive tenant.

At the termination of tenancy compensation may be claimed for the unexhausted value of fertiliser used.

Superphosphate Stimulates the Growth of Clover.

Provision of Capital for Farm Improvement.

For the development of farms and agriculture generally, additional capital is always necessary, and there appears to be no better means of securing such capital than by combining the resources of landlord and tenant. In Great Britain, following centuries of farm development, more capital is still necessary for this purpose. One of the greatest handicaps to profitable production on many of our farms is undoubtedly lack of capital, and the landowner is often unable to supply the capital required to develop his asset. In the case of tenant-operated farms the opportunity exists for the tenant to supply some or all of the capital necessary for improvements.

Literature Referred To.

In the compilation of this article, reference was commonly made to the following works on farm tenancy:—

"Agricultural Tenancies in England"—Sir Henry Rew, K.C.B. (1926).

"Farm Tenure Improvement" — United States Department of Agriculture (1940).

"Soils and Men"—United States Department of Agriculture (1938).

"Legal Aspects of Farm Tenancy" — Bulletin 465, University of Illinois Agricultural Experiment Station (1940).

"Farm Leases for Illinois"—Circular 503, University of Illinois Agricultural Experiment Station (1940).

Approved Seed—October, 1943.

To assist in the production and distribution of approved seed of recommended varieties of crops and vegetables, the Department publishes in this list each month the names and addresses of growers of such seed. For this service a charge of 2s. 6d. is made for each insertion of each variety listed. The number of varieties listed on behalf of each grower will be restricted to twenty-five for the time being. The Department may inspect the crop producing the seed, and in all cases a sample of the seed must be sent to the Department of Agriculture with information as to the location of its production, and must be accompanied by the fee indicated above.

If any seed producer does not wish to pay the advertising charge he may submit his name with the variety of seed and sample to the Department, and if it is approved his name will be listed in the Department and information will be supplied regarding it to inquirers.

Maize.—
Fitzroy—Manager, Experiment Farm, Grafton (10s. per bus. f.o.r. Grafton).

Sorghum.—
White African—Manager, Experiment Farm, Grafton (3d. per lb.).

Broom Millet.—
Manager, Experiment Farm, Bathurst. (6d. per lb.).

Tomatoes.—
Potentate—Rumseys Pty. Ltd., Church-street, Parramatta.

Cauliflower.—
Shorts—H. Burton Bradley, Sherwood Farm, Moorland.

Parsnip.—
Hollow Crown — Department of Agriculture, Sydney. (3s. per lb.).
Yates' Hollow Crown—Arthur Yates & Co. Pty. 184 Sussex-street, Sydney.

Garden Peas.—
Greenfeast — Mr. S. Lee Archer, "Ebenezer," Tumorrama, via Tumut.

Beet.—
Yates' Derwent Globe—Arthur Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.

Cabbage.—
Yates' Vanguard—Arthur Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.
Yates' Derwent Re-selected Early Drumhead—Arthur Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.

Cucumber.—
Early Fortune—Arthur Yates & Co. Pty.. Ltd., 184 Sussex-street, Sydney.

Pumpkin.—
Yates' Re-selected Queensland Blue — Arthur Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.
Yates' Re-selected Triamble—Arthur Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.

Swede.—
Yates' Champion Purple Top—Arthur Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.

Should You Plant by the Moon?

BECAUSE statements are frequently made by farmers that planting crops during certain phases of the moon is conducive to favourable plant growth, the following extract from the report of the Australian Association of Scientific Workers should be of particular interest:—

"It is often claimed that the germination of seeds and growth of the resulting plants are most successful when they are sown at some favourable time, as determined by astrological aspects, particularly the moon. As this would be of great agricultural importance if true, exact scientific experiments were carried out in recent years.

"At the State Botanical Institution at Munich in 1937 and 1938, seed was sown on days designated as favourable or unfavourable according to the Moon Calendar of Lorenz and Bauer. Otherwise the plants were treated in a normal manner. Results showed clearly that radish, common radish, cucumber, tomato and certain other plants produced equally good crops irrespective of whether the day of sowing was 'favourable' or not.

"Experimental trials were carried out at the John Innes Horticultural Institution in 1940. Radishes, cabbages, beans, carrots and onions were sown four times during every lunar cycle, the seeds being placed in the ground two days before the dates on which each of the four quarters of the moon fell. Seed was sown both in and out of doors. The results showed that outdoors temperature had a greater effect than any other factor. There was an improvement in April, due to rising temperature, and a large fluctuation in late June, probably due to low rainfall, which effect had been minimised by watering the drills, before sowing. The June drought had the greatest effect on the smallest seeds (carrots); the larger seeded radishes, cabbages and beans showing progressively smaller fluctuation. No correlation was found between speed of germination and phases of the moon, a phase giving good germination in one month but giving poor germination in other months.

"It was found that indoors, the speed of germination was much more constant than outdoors owing to greater control over the conditions of temperature and moisture. Here, also, no consistent effect of the moon was observed.

"Thus, sowing in good conditions of soil and weather will always give good results, while sowing with the moon will convey no advantage, and may result in a sacrifice of some of the proven advantages of good soil and weather conditions.

It should be noted that the investigations quoted were conducted by research institutions of international standing.—S. L. MACINDOE, Plant Breeder.

The Geologic Sources Of the Commoner Chemical Elements.

Their Agricultural Significance.

(*Continued from page* 311.)

A. N. OLD, B.Sc.Agr., Analyst.

IODINE.

IT is perhaps not generally realised that iodine, one of the best known of the chemical elements, has a comparatively short history, having been discovered in 1811 by Courtois, a manufacturer of saltpetre near Paris during the Napoleonic wars. He obtained the element from seaweed ash by the addition of sulphuric acid, and in describing it some two years later stated: "The wonderful colour of its vapour suffices to distinguish it from all other substances known up to the present time, and it has further remarkable properties which render its discovery of the greatest interest."

Gay Lussac pointed out the analogies between the new substance and chlorine established its elemental nature, and named it "iode," the French equivalent of iodine—from the Gk. "iodes," violet-like, in reference to the colour of the vapour.

Occurrence.

Iodine is the least abundant of the four halogen elements. It occurs usually in combination, but there are at least two recorded cases of free iodine in spring waters—a spring at Pahua, New Zealand, and Woodhull Spa, Lincoln, England.

Of the primary minerals of igneous rocks, none are known which contain iodine, but it has been detected in volcanic gases.

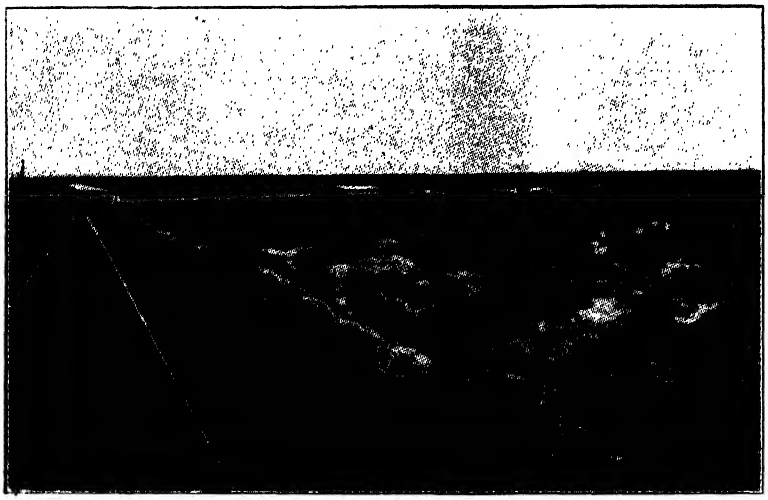
The chief reservoir of iodine is the sea, where it occurs in small amounts in solution, probably as iodates; it is actively taken up by many seaweeds, particularly those growing at the deeper levels, and also by certain marine animals. Many saline lakes contain the element.

The Chile nitrate deposits contain a small amount of iodine as lautarite (calcium iodate); sodium and potassium iodates are

also stated to occur. These deposits are the chief commercial source of iodine; a smaller amount is obtained from seaweed.

Alhough Chile has the largest output of iodine, other countries now make a significant contribution. Pre-war figures for the leading producers were: Chile 832 tons, U.S.A. 135 tons, Java 100 tons, Japan 48 tons, Italy 25 to 30 tons.

for animals, however, it is an essential element. It is required for the production of thyroxin, the active hormone of the thyroid gland, a deficiency of which results in goitre and related diseases. In some parts of the world, Switzerland, for example, it is necessary to add iodine to the drinking water.



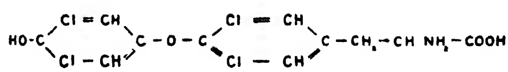
Nitrate Grounds and Works, Chile.
Iodine is obtained as by-product.

The metallic ores containing iodine—iodides of silver, copper, lead and mercury—are rare, but of special interest because of the occurrence of a number of them at Broken Hill. Such local minerals are: iodyrite (AgI), an iodide of silver; iodembolite, a chloride, bromide and iodide of silver; miersite (4AgI, CuI), a very rare iodide of silver and copper; marshite, an iodide of copper; tocornalite (AgI HgI), an iodide of silver and mercury. Recorded elsewhere are the mercury mineral coccinite (HgI_2) and the lead mineral schwartzembergite, $Pb(ICl)_2 2PbO$.

Iodine in Agriculture and Commerce.

There is little evidence that iodine is of appreciable significance in plant metabolism;

Thyroxin has the formula $C_{15}H_{11}O_4NI_4$, or



It can now be synthesised in the laboratory.

Iodine has many uses in chemical operations, particularly in volumetric analysis. It is a well known antiseptic, and, as iodides, is used in medicine as a deobstruent, a term which refers to its ability to drive out impurities from the blood and tissues, though the mode of action is unknown.

(To be continued.)

Varieties of Approved Seed Available.

IN order that farmers may be directed to what are regarded by the Department as the most satisfactory local sources of approved seed of recommended commercial varieties of farm crops and vegetables, the Department is willing to supply information concerning such sources of seed of the following varieties:—

Maize.—
Golden Superb, Golden Nugget, Golden Beauty and Leaming.

Grasses, etc.—
Phalaris tuberosa, Subterranean Clover (mid-season), Sheep's Burnet, Lucerne, Sudan.

Making the Best Use of Farm Machinery.

THE circumstances which necessitated the appointment of a State Controller of Agricultural Machinery are such that national good, rather than individual benefit must be the justification for the supply to farmers of many types of implements of which stocks are low. The problem facing the Controller is to divert the small number of machines which are available into avenues of production deemed most important, and to place the implements in the hands of those producers who will make the best use of them.

It is not always easy for farmers prepared to spend the money to purchase machines which they require to save man-power on their properties, and even increase production, to appreciate the merits of a decision disallowing purchase of a machine. The history of a recent case of apparent hardship will perhaps help to show that the control authority has to adopt "greatest possible use of available machines" as the standard.

A poultry farmer made application to purchase a rotary hoe to grow green feed, because the contractor who previously did the work in the district had moved on. He desired to do his best to increase the number of poultry on his farm this year in accordance with the Government desires, but was handicapped by the fact that he had to dig and plant his green feed area by hand. He thought that this would even mean that he would have to reduce the number of birds.

After investigation and report by the District War Agricultural Committee, his application was refused by the State Controller. His protest that this was hindrance and not help in food production seemed sound, until he said, "Even if I only used the hoe for two hours a week you can imagine the amount of work it would do compared with digging by hand." His claim that "I can assure you that I would not be wanting to spend £147 on a hoe unless it was necessary from the labour-saving point of view" cannot be given the consideration it might appear to warrant at first sight, for the State Controller had to base his decision on the fact that rotary hoes are in short supply and they are urgently needed for the production of vegetables, in which work they can be used to full capacity.

There must be many cases in which the purchase of a machine would ease the burden for the farmer, but with supplies limited as at present, it is necessary in the interest of the nation that available machinery be used to best advantage.

Dairy Produce Factories are "Factories" Under the Factories and Shops Act.

THE attention of manufacturers of dairy produce is drawn to recent amendments to sections 33 and 36C of the Factories and Shops Act which concern the guarding of machinery and the provision of welfare facilities for employees.

Section 33 of the Factories and Shops Act provides that the occupier of a factory shall securely fence all dangerous parts of machinery therein, while section 36C of the Act provides that appropriate action shall be taken by the Factory Welfare Board to secure the safety, health and welfare of employees in factories.

Pursuant to the Factories and Shops (Amendment) Act, 1943, a paragraph has been added to both of these sections as follows:—

> In this section the expression "factory" includes (in addition to any premises which constitute a factory as defined in section 3 of the Act) any building used for the manufacture of dairy produce. . . .

The Acting Under Secretary of the Department of Labour and Industry and Social Services points out that the effect of this paragraph will be to require the occupiers of factories engaged in the manufacture of dairy produce to observe the requirement to fence the dangerous parts of machinery and also to provide welfare facilities for the use of the employees. The welfare facilities referred to would normally include dressing and dining facilities.

Demand for Broom Millet.

OWING to the unprecedented demands for brooms due to Service and war industries' requirements, the trade will require considerably more fibre than it does in peace time, points out a recent departmental report. As a guaranteed ceiling price of £75 per ton in Coastal and Tamworth districts, and £72 10s. elsewhere, has been fixed by the Prices Board, growers should take the opportunity, if weather and soil conditions are favourable, of sowing increased areas.

Broom millet seed should be obtained from a reliable source and should be treated by dusting with ceresan or agrasan at the rate of 2 oz. per bushel to control kernel smut. This disease was noticeable in a number of crops last season, and the control suggested is cheap and effective.

A leaflet on the growing of broom millet is obtainable free on application to the Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney.

PRIMARY producers and District War Agricultural Committees have been urged, in view of the short supply of ammunition, to make every endeavour to economise in its use. Tamworth D.W.A.C. has given a lead in this respect by organising hare "drives." In the first drive 322 hares were destroyed with less than 500 cartridges. Encouraged by this effort, two other drives were conducted, and a total of 805 hares were destroyed.

The Committee organised the shooters, who paid for their own cartridges, and the proceeds of the sales of skins (in total £78) were donated to a local patriotic fund. Hares are still plentiful and drives are to be continued.

When Picking Cherries

Great Care is Necessary to Avoid Injury.

J. A. BALLANTYNE, Special Fruit Instructor.

Picking for Market.

MANY varieties of the cherry are most delicate and very susceptible to injury, and the fruit must therefore be handled carefully. It should be gathered when dry and cool, and when not more than firm ripe. The fruit should be picked with the stalk intact, separating it carefully from the spurs or branches, as it keeps much better with the full stalk, and care should be taken to see that the fruit spurs are not broken off at the time of picking; much damage may be done in this way by careless pickers, resulting in loss in the succeeding crops. The proper way to handle the fruit is by the stems.

Varieties which bruise easily should be picked into shallow baskets holding about 10 lb. Kerosene tins which have been cut in halves for the purpose have also been found suitable, though some prefer the side taken out of the kerosene tin; in either case, the edges should be turned and well beaten down to avoid injury to the fruit, when emptying the tin.

It is important that whatever picking utensil is used, it should be capable of being slung to the picker's shoulders or hooked on to the limb or ladder convenient to the picker, leaving both his hands free for picking. Many varieties have long, rather slender limbs that will bend down readily. These can be held down under the picker's arm while he picks with both hands.

Picking for Processing.

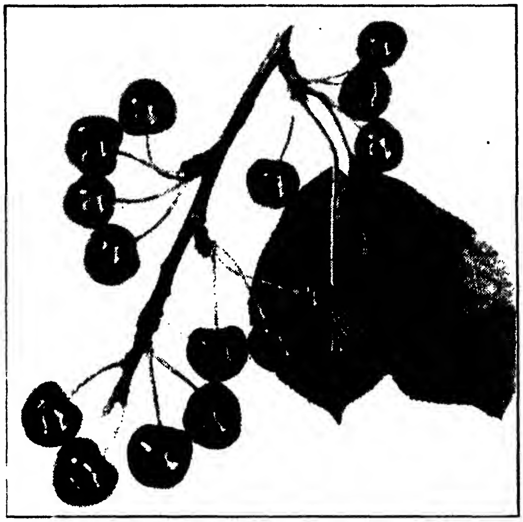
The processing of crystallised cherries has extended considerably in New South Wales during the last few years, and has now been placed on a sound footing—with advantage to the grower.

In some districts fruit for this purpose has been harvested without stalks, and the saving of labour, containers and transport which has resulted is of special significance at the present time. The saving of labour is considerable, since the costly after-harvest removal of the stalks is dispensed with, while there is a considerable saving of space in the brining vats and valuable chemicals

used in the preservation of the fruit are saved. Speed and monetary advantage add to the benefits of this method of harvesting. According to the estimate of the processors, an additional payment of at least 1s. per case should accrue through the pools, and there is a likelihood of payment being higher.

There appears to be opposition in some districts to leaving the stalks on the trees, growers contending that the practice is detrimental to the development of fruit buds and that it results in a reduction in the following crop. The unsightly appearance of the trees with the stalks adhering to the spurs is also put forward as another argument against picking cherries without stalks.

However, records from trees from which fruit has been picked without stalks, over a period of four years, do not show any variation in cropping when compared with trees from which the fruit has been harvested with stalks intact. Actually it would appear, from observation, that when picking fruit without stalks, fewer spurs are broken than is the case where the cherries are picked with stalks retained. The unsightly appearance of the trees is of little consequence as it is found that the stalks soon shrivel and fall.



The Home Preservation of Fruit Juices.

E. G. HALL, B.Sc.Agr., Fruit Research Officer.

THE preservation of fruit juices in the home is quite practicable with little more than the usual kitchen equipment, and will enable use to be made of these health-giving beverages during out-of-season periods. Because of their vitamin and mineral content and general alkaline reaction in the body, the daily consumption of fruit juices is being increasingly advocated by medical authorities and nutrition specialists. A 50 per cent. retention of Vitamin C can reasonably be expected in juices preserved in the home by the methods described below, whereas it is almost entirely destroyed when jams and jellies are made. The Vitamin C content will slowly decrease during storage.

This article on the preservation of citrus juices is the first of a series on the home preservation of fruit juices.

Preservation of Citrus Juices.

The Vitamin C Content.

The juices of citrus fruits are an extremely valuable source of ascorbic acid or Vitamin C, the only other readily available comparable sources being green, leafy vegetables—particularly vegetables of the cabbage family, which must be correctly cooked—tomatoes and also potatoes (because of the amount which is usually eaten). New potatoes cooked in their skins are a good source of Vitamin C.

Certain berry fruits, particularly black currants and guava fruits, are rich in Vitamin C, and passion fruit contains very useful amounts of this essential vitamin. Stone and pome fruits contain negligible amounts of Vitamin C.

Average figures for the Vitamin C content of freshly-extracted juices are:—

	Milligrams. Per cent.*	Milligrams. Per pint.
Orange	60	340
Lemon	45	250
Grapefruit..............	35	200
Mandarin	30	170
Tomato	25	140
Passion fruit...........	25	140
Pineapple	15	80

There is more Vitamin C in orange juice than in other citrus juices, and there is slightly more in Valencia orange (60-65 mgms. per cent.) than

*** Used as an abbreviation for milligrams per 100 c.c. of liquid or per 100 grammes of solid material.**

there is in Navels (55-60 mgms. per cent.). An adequate daily intake of Vitamin C for a child or an adult is about 60 milligrams, and this amount can be obtained from a quarter of a pint of fresh orange juice or about half a pint of home preserved orange juice. It is not usually necessary, however, to drink this amount of orange juice or its equivalent in other juices or fruits per day, as the daily consumption of correctly cooked, green, leafy vegetables and potatoes, parsnips or turnips will provide appreciable amounts (about 20 milligrams) of this essential vitamin. It should be remembered that Vitamin C in cooked vegetables is rapidly lost if they are not eaten as soon as cooked.

Difficulties of Preservation.

Although 50 per cent. of the Vitamin C in the juice can be retained by methods suitable for preserving in the home, these methods result in considerable undesirable changes in the juice. Citrus juices, particularly orange juice, are difficult to preserve, even commercially, and in home preservation the development of bitterness, loss of natural flavour, darkening of the colour and other changes in the appearance of the juice can be expected.

These changes and the loss of Vitamin C, which still go on slowly during storage, are accelerated by contact with most metals, particularly iron and copper. During all stages of preservation, therefore, the juices should not come in contact with any metals except stainless steel or aluminium. The production of orange juice with a reasonably good flavour and appearance is not possible in the home, and under commercial conditions requires the use of expensive equipment for vacuum de-aeration and flash pasteurisation.

Selection of the Fruit.

It is recommended that the home preservation of the juice of navel oranges should not be attempted, as it quickly becomes objectionably bitter. Valencias and other seeded oranges are satisfactory, but the best juice with least bitterness and most flavour, is obtained from Parramatta seedling oranges. The juice of lemons, grapefruit, and limes can be preserved satisfactorily in the home. Not much is known about mandarin juice, but it is probably somewhat easier to preserve than orange juice, but more difficult than the other juices.

The fruit used should be mature, as the juice from immature fruit will develop considerable bitterness. It must be sound, clean and well washed, and all utensils used must be scrupulously clean in order to reduce initial contamination of the juice to a minimum.

Extraction of the Juice.

After slicing in half with a stainless steel knife the juice may be extracted on the larger type of glass or plastic squeezer which has a large ribbed cone; the small old-fashioned type of lemon squeezer which has a small pointed cone is of little use. Extractors with an electrically-driven cone may be used, but they aerate (froth) the juice more than hand reaming. Increased aeration of the juice will increase the development of bitterness and the loss of Vitamin C. However, this method will be quicker than hand reaming, and thus will allow less time for absorption of oxygen from the air.

After extraction the juice should be handled rapidly to minimise undesirable changes before bottling. The juice should next be strained through a double thickness of cheese-cloth or even an aluminium or enamel colander to remove coarse seeds and pulp. If cloth is used the pulp in the cloth should be well squeezed to obtain as much juice as possible.

Sweetening.

The addition of sugar helps to retard deterioration of the juice, and usually improves the palatability. It is impossible strictly to lay down the amount of sugar to be added because of the variability in the fruit and the variability in individual taste.

In the case of orange and mandarin juice the amount to be added can best be determined by taste. Grapefruit juice, because of its natural bitterness and usually greater acidity, generally requires the addition of more sugar than does orange juice, and up to 2 lb. sugar may be added to each gallon of juice. A popular commercial grapefruit juice is made by mixing 7 pints of juice with 3 pints of 4 lb. syrup (syrup containing 4 lb. of sugar in a gallon of water, or ½ lb. per pint). Up to 4 lb. of sugar may be added with advantage to each gallon of lemon or lime juice.

Processing of Orange Juice.

If orange juice is not heated to a temperature of 203-5 deg. Fahr. it will clear during storage, that is, the suspended material in the juice will settle as a coarse deposit to the bottom of the bottle and will not redisperse on shaking to give the original normal appearance. Such "cleared" juice tends to have a weaker and slightly foreign flavour compared to fully processed juice.

However, the improved appearance obtained by heating to 203-5 deg. Fahr. is considerably offset by an increase in the degree of cooked or marmalade flavour. This can only be avoided if the juice is flash pasteurised, but this is not possible in the home. Although heating to 200 deg. Fahr. (which is high enough under home conditions) is recommended, the preserver could also try some heated to only 170 deg., as outlined below, for lemon and grapefruit juices, and could decide which method, in his or her opinion, produced the better juice. A temperature of 170 deg. Fahr. maintained for thirty minutes is quite adequate to pasteurise the juice.

The "Hot-fill" Method.

Immediately after filtering and the addition of sugar (and preservative if used), the juice is rapidly heated to a temperature of 200 deg. Fahr. (practically boiling) in a double aluminium or unchipped enamel saucepan, or in a single saucepan with continuous stirring to minimise scorching which is likely with direct heating. It is immediately poured hot into previously prepared hot bottles which are filled to overflowing. The bottles are then sealed and stood, upside down on wooden slats or bags or a cloth, in a hot water bath at 170 deg. Fahr. (when steam first appears), in which they are kept for thirty minutes. They are

then taken out, cooled away from draughts (which may cause bottles to crack) and then stored in the coolest dark place available. The seal used must be quite airtight, otherwise the juice will not keep. A useful precaution is to dip the tops of the sealed bottles, while still hot, in molten paraffin wax.

The bottles are prepared by first thoroughly cleaning and then placing in cold water in the copper or other suitable vessel, with wooden slats or bags on the bottom to protect them from direct heat. The water is brought to the boil and boiling continued for ten minutes. The bottles are taken out and filled immediately with the hot juice.

Crown seals, Kork-n-Seals or corks can be used for sealing the bottles. Just before use, Kork-n-Seals and corks should be boiled for ten minutes in a saucepan with the lid on, but Crown Seals cannot be so sterilised, as the inner lining is destroyed.

The "Cold-fill" Method.

In this method cold, sterilised bottles are filled with cold juice, and then heated in a water bath. The bottles are first boiled and cooled away from draughts. The freshly extracted juice to which sugar and the preservative (if used) is added, is poured into the bottles until it reaches 2 inches from the top. The bottles are then stood in cold water to the level of the juice and the water is then heated until the juice reaches a temperature of 200 deg. Fahr. when the bottles are taken out and sealed securely. They are then put back in hot water at a temperature of 170 deg. Fahr. in an inverted position, and kept there for thirty minutes; then taken out, cooled and stored.

Lemon Juice and Grapefruit Juice.

These juices are more readily preserved than orange juice, and do not require heating to a temperature higher than 170 deg. Fahr. Any developed bitterness, which is less than in orange juice, is masked by the high acidity of lemon juice and the natural bitterness of grapefruit juice. Furthermore, lemon and grapefruit juices are usually diluted before consumption.

It is reported that the incorporation of too much oil from the skin, which can happen when freshly picked lemons are extracted, spoils lemon juice. To overcome this, lemons should be held before extraction for several days after picking to "cure" and dry out the skin.

Except that the juice is heated only to a temperature of 170 deg. (simmering) before bottling in the case of the "hot-fill" method and in the open bottles in the case of the "cold-fill" method, the procedures are the same as those outlined for orange juice.

Mandarin and Lime Juice.

Mandarin juice is highly flavoured and coloured, and is reported to be somewhat more stable than orange juice. In the absence of detailed data on the preservation of mandarin juice it should be treated like orange juice; that is, heated to 200 deg. Fahr., although a small lot could be tried heated to only 170 deg. As mandarins are readily peeled the juice may also be extracted by pressing the peeled fruit.

Lime juice being very sour should be treated like lemon juice.

Preservatives.

Although the recommended heating treatments are quite sufficient to preserve the juices when scrupulous cleanliness is observed and the processing is carefully done, it is always safer to add preservative. Preservative should always be added if the juice is required to keep for more than one day after opening.

The preservative should be added to the juice before heating is commenced; that is, immediately after filtering and at the same time as the sugar is added, by dissolving in a little water and stirring into the juice. It is recommended that 1 grain of sodium benzoate and 2 grains of sodium or potassium metabisulphite be added to each pint of juice. If metabisulphite is not obtainable, use 2 grains of benzoate; if benzoate is not obtainable, use 4 grains of metabisulphite.

These amounts of preservative will be discernible to the taste, but when both preservatives are used there is less darkening and "off" flavour from the benzoate, and the taste of the combined preservatives is considered by many people to be less than when either is used separately. Metabisulphite alone is preferable to benzoate alone, as the taste is less to most palates, there is less darkening and metabisulphite has some preserving effect on Vitamin C. The use of the two preservatives, although allowed in America commercially, is not allowed here under the Pure Food Act but would be all right for private use. As a grain is a very small quantity, those preserving small quantities of juice for home use should get their chemist to weigh out the amounts of preservative required for each batch.

General Considerations.

All utensils and the place where the preserving is being done must be scrupulously clean, because citrus juices readily absorb odours and because initial contamination of the juice must be kept to a minimum.

The juice must not contact any metal except stainless steel or aluminium.

A kerosene tin is a useful vessel for processing small lots, as it is deep enough to cover upright bottles and also all work can be done in the kitchen without recourse to the laundry copper.

To obtain the best results all work should be done rapidly; there should be no delay between extraction and the commencement of heating, and heating should be done as quickly as possible, for any exposure to air or heat injures the flavour and destroys Vitamin C.

For the same reason the amount of air left in the bottle after it is sealed is reduced to a minimum by heating the juice in open bottles in the "cold-fill" method to drive off as much air as possible, and by filling the bottles to overflowing in the "hot-fill" method.

After processing, the bottles of juice should be stored in the coolest place available, because the rate of deterioration of the juice during storage increases as the storage temperature rises. It is also advisable to use brown or green glass bottles if available, instead of white glass bottles and to store them in the dark, for exposure to light tends to increase deterioration of the juice.

The maintenance of the temperatures within less than 5 deg. Fahr of those given, is necessary for best results and to do this the use of a thermometer is essential. However, if no thermometer is available a satisfactory product can be obtained by heating, until the first bubbles appear, when 200 deg. Fahr, is indicated and to the point when steam first appears, when 170 deg. is indicated. When using a thermometer the temperatures should be taken in the bottles by inserting the thermometer into the juice in the open bottles, or if the bottles are sealed a dummy, uncorked bottle of water should be processed also and the temperatures taken in it.

If a thermometer is purchased it should be one reading up to 240 degrees Fahr. and should be checked against a standard thermometer in both hot water at about 150 deg. Fahr., and in boiling water, as many thermometers sold have an error of sometimes 3 or 4 degrees. The correctness of a thermometer at the boiling point of water, which is 212 deg. Fahr. at sea level, can be tested by placing the bulb in rapidly boiling water and reading the temperature shown. It must be remembered, however, that the boiling point of water falls by 1 deg. for every 500 feet of elevation above sea level, thus at a place 2,000 feet above sea level the temperature of boiling water will be only 208 deg.

Blending.

Very attractive products can be made by blending various citrus juices, and particularly by blending citrus juices with the juices of other fruits, especially pineapple, berry, apple and apricot juices. The blending is best carried out before processing. Mandarin juice blends well with lemon and grapefruit juices, and orange and lemon and orange and grapefruit are satisfactory blends. In the latter case Navel oranges can be used, as their bitterness will be masked by the natural bitterness of the grapefruit juice. Blending equal parts of the different juices is satisfactory, but the proportions can be varied to suit individual taste.

A blend of equal parts of orange and pulpy apricot juice gives a particularly attractive and tasty juice. Pineapple and orange blends are very useful, as the two flavours blend well together, and there is better preservation of orange flavour than in straight orange juice. An attractive juice is made from two parts of pineapple juice, two parts of orange juice and one part of lemon juice, to which sugar is added at the rate of 1½ lb. per gallon, or about a small cup full to the pint. For use the juice is diluted with one or two parts of water or soda water.

The different blends which contain orange juice should be processed to 200 deg. Fahr. as set out previously for straight orange juice. Heating to 170 deg. Fahr will be satisfactory for the other blends.

Superphosphate Supplies for Autumn-sown Crops.

FARMERS and graziers who are entitled to a quota of superphosphate for use in the autumn on crops other than priority crops are urged by Mr. A. W. S. Moodie, Fertiliser Rationing Officer, Department of Agriculture, to lodge orders early and to accept early delivery.

The closing date for orders lodged through agents or direct with manufacturers has been fixed for 31st December, but farmers will assist the fertiliser companies, the transport authorities and themselves by lodging orders prior to 30th November.

Last year a great number of farmers and agents asked for delivery of fertiliser during the period 1st to 15th March; this demand was so great that the supply of railway trucks was inadequate, and many complaints regarding late deliveries were received. The prospects of obtaining trucks for fertilisers are distinctly better during the period 15th December—30th January than during February and March, and in their own interests farmers should arrange to take delivery during that period.

In regard to orders lodged after 31st December, no guarantee can be given that supplies will be available.

The Growing of Turnips and Swedes for Fodder.

(Continued from page 450.)

seeding and thick crops. The aim should be to farm so that the swedes and turnips will get a strong start and make good growth, and the aphids will then be checked as far as is practical.

The cabbage moth does some damage, but is not usually serious enough to cause worry, and so far the cabbage butterfly has not appeared on the Northern Tablelands. Rabbits are troublesome, but the remedy is obvious for this pest.

Serious diseases have not yet been reported in turnips and swedes in this district, even where the crops have been grown on the same land for several years. Brown heart, which is believed to be due to boron deficiency, occurs fairly widely, particularly on black soils, but is has no marked effect on the yield or fodder quality.

PLANT DISEASES

Notes contributed by the Biological Branch
Division of Science Services

Psorosis—A Virus Disease of Citrus.

PSOROSIS or scaly bark was first noted in New South Wales about fifteen years ago, but so far has not proved to be a disease of great economic importance. In other parts of the world, however, notably California, it has been necessary to adopt strict measures to prevent it becoming widely distributed. The discovery of a tree affected with psorosis in an orange grove may cause anxiety to the grower and the question is often asked "Will it spread to surrounding trees—should the affected tree be cut at once and burned?"

Psorosis is a virus disease, and the only method by which its transmission has been demonstrated is by budding or grafting. Other methods of transfer may exist—there may be a rare insect vector so far undiscovered—but such possibilities are of negligible importance in practice.

The disease is slow to manifest itself, the usual age at which infection shows up being fourteen years or more; sometimes a tree may be over thirty years of age before symptoms are detected. It affects first the outer layers of the bark of the trunk and main branches, and sometimes small limbs also, the earliest symptom being the formation of an inconspicuous blister and the scaling off of small circular pieces of the outer bark. As these small patches of bark die, the inner bark beneath becomes discoloured with a faintly yellowish tinge. The original spot enlarges very slowly. At first new bark forms under the loose dead scales, but this does not remain healthy; the scaling process continues and the bark becomes thick and roughened with conspicuous flakes and scales of dead bark in various stages of exfoliation.

Little or no effect on the general health of the tree can be noted until the lesions are quite extensive. Then gradually the limb above the affected area becomes thin and unprofitable, and finally, as the outbreaks extend over the larger part of the limbs and trunk, the whole tree becomes unthrifty.

In California, where the disease has received considerable attention, leaf symptoms have been noted associated with psorosis, often preceding the outbreak of bark lesions. These are small, elongated, light-coloured flecks in the regions of the smallest veins, and are only to be seen in young leaves. So far this particular symptom has not been detected in association with psorosis in New South Wales.

Treatment.

The disease can sometimes be cured in the early stages by cutting away all infected tissue and painting the wound with a disinfectant such as Bordeaux paint, but being so inconspicuous, it is not usually detected until the lesions are too far advanced for treatment. When the disease has developed sufficiently to produce a marked effect on

Psorosis on a Young Orange Limb.

A Mandarin Tree Showing Advanced Stage of Psorosis.

the foliage, the lesions on the trunk are usually large and deep, and treatment at this stage has not proved effective in checking the disease.

If psorosis appears in a few trees in a block, the remainder should be inspected regularly for early symptoms and treated at once if such symptoms are found. Even when they are beyond treatment, affected trees may produce profitable crops for years and should be retained so long as they continue to do so, since the disease does not appear to spread to adjacent healthy trees. There is no danger of replants contracting the disease from the soil.

The chief precaution to bear in mind is that bud wood should never be taken from affected trees, or from trees known to have come from the same source as infected trees.

Powdery Mildews.

THIS group of fungous parasites is most active during the summer and autumn months. A wide range of plants, including vegetables, ornamentals, fruit trees and vines, are subject to attack, but as a rule each race or strain of the powdery mildew fungus is restricted in its attacks to a particular host, or group of related hosts. One strain, for example, attacks peas, another roses, a third marrows, pumpkins, squashes and melons, and so on.

Symptoms.

The first signs of the disease are the appearance of small, white, circular patches on young stems and leaves. These increase in size, often running together, to cover extensive areas of leaf surface, and become powdery or mealy owing to the production of masses of spores which disseminate the disease to the young foliage as it is formed. Unlike most leaf-attacking fungi, which require humid conditions for their development, the powdery mildews are able to flourish under quite dry conditions. Nightly dews provide sufficient moisture to allow infection to spread.

The fungus is, in most cases, almost entirely external, developing a mass of

Rockmelons showing the Effect of a Severe Attack of Powdery Mildew.

Left.—Sprayed with Bordeaux mixture.
Right.—Unsprayed plot.

fungous threads and spores on the surface of leaves and young green stems. Small peg-like processes are sent down into the surface cells of the host, and by means of these the fungus extracts the necessary food material. Considerable distortion, and reduction in leaf size, can be caused, with consequent effect on the flower and crop production.

Because of the nature of its growth, the presence of powdery mildew on the surface of a leaf greatly increases the rate at which water is evaporated from the plant surfaces.

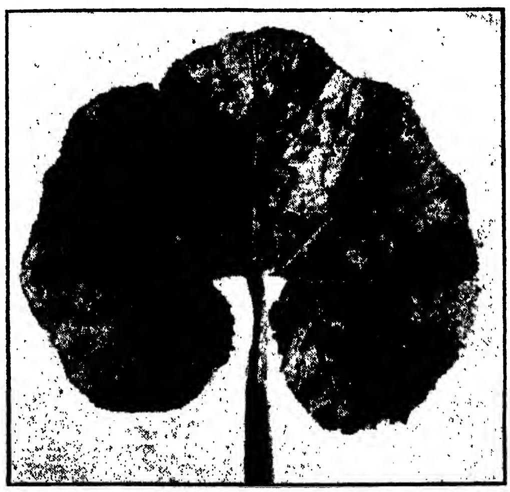
Powdery Mildew of the Rose.

Control.

With powdery mildews as with most other plant diseases prevention is better than cure, and often considerable damage may be done before the disease can be detected.

Plants subject to powdery mildew should be dusted regularly with a dusting sulphur, or a mixture of hydrated lime and finely divided sulphur.

Some varieties of plants need special treatment. Rockmelons and cucumbers are subject to scald if dusted with sulphur, and should, therefore, be sprayed at weekly intervals with Bordeaux mixture 3-4-40 instead. The rockmelon variety, Powdery Mildew Resistant 45, shows a high degree of resistance to this disease. Related plants such as pumpkins and squashes may safely be



Powdery Mildew on the Under-surface of a Pumpkin Leaf.

dusted with sulphur. In the case of powdery mildew of apples, obviously affected shoots should be removed and burned during the winter pruning activities. Subsequent sulphur sprays applied for black spot will contribute to the control.

Following is a list of the plants more commonly affected with powdery mildews:—Rockmelon, pumpkin, marrow, squash, cucumber, vines, apple, pawpaw, rose, delphinium, hydrangea, sweet pea, Michaelmas daisy and verbena. Pea, chrysanthemum and dahlia are also frequently affected, but usually not seriously enough to warrant the use of control measures.

SEASONAL NOTES IN BRIEF.

Tomatoes Should be Sprayed Regularly.

As a safeguard against early blight (*Alternaria solani*) and late or Irish blight (*Phytophthora infestans*) coastal crops of tomatoes should be regularly sprayed with Bordeaux mixture 1–1–20. This should be done at 10-14 day intervals during spring and autumn months, and may also be necessary in the summer if the weather is wet or humid. Where nicotine sulphate or lead arsenate is added to the Bordeaux mixture for insect control, a strength of 1–1–40 is advised. Colloidal sulphur or wettable sulphur may also be added to Bordeaux mixture to control mites. If summer conditions are dry and hot, it may be advisable to omit the fungicide Bordeaux mixture and apply only the sulphur dusts or sprays as recommended by the Chief Entomologist.

Early Blight or Alternaria Leaf-spot.
Spots are concentrically zoned or target-like.
[*After Weber and Kelbert.*

Bordeaux mixture has consistently proved in Departmental tests to be superior to other sprays and dusts for the control of tomato diseases, and in addition is the cheapest to make up.

Growers should not wait until the diseases have appeared in their crops before applying the first spray. It should be remembered that the actual appearance of leaf spots may be days or even weeks after infection has taken place, and that the disease may actually be well established by the time the first symptoms are noted.

Storage Rots of Potatoes.

Considerable wastage occurred in early-dug potatoes last year. A number of factors contributed to this, but not the least important was rotting following injury. Injury during digging or grading paves the way for the entry of organisms causing dry rots (*Fusarium* spp.) or watery rots or "leaks" (*Pythium* spp. and bacteria), since these organisms are always present in the soil. Rot causing organisms may also follow moth infestation. New potatoes, and those showing various forms of second growth, are especially subject to injury from bruising.

It is important that no injured or diseased tubers should be bagged with healthy tubers, since they are liable to prove a source of infection if the potatoes are to be stored for any length of time.

INSECT PESTS.

Notes contributed by the Entomological branch.

Fruit Flies

(*Strumeta tryoni.*)

Commercial fruit growers, and farmers and graziers and even home gardeners who may have only a single fruit tree in the prescribed areas, are reminded that measures for the control of fruit flies are compulsory under the Plant Diseases Act. These compulsory control measures include the use of foliage poison baits and the regular destruction of all infested and fallen fruits. In addition, all loquats grown in the coastal areas of this State must be removed from the trees by 31st October.

The Queensland fruit fly, which is the common pest species in the coastal areas and in certain other districts of this State, is rather wasp-like in general appearance, reddish-brown in colour, and a little larger than the house fly. The thorax or mid-portion of its body is marked by a number of distinct lemon-yellow patches which are very pronounced in life. It has only one pair of wings, which are clear, with the exception of a narrow, dark band along the front margins and a transverse stripe near their base.

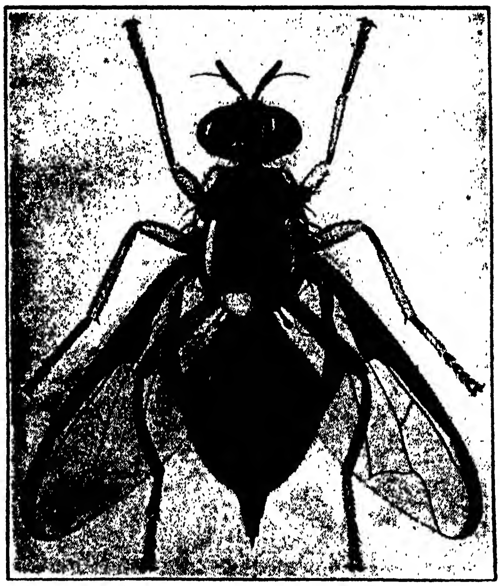
The female may be readily distinguished by the conspicuous, sting-like, horny ovipositor, or egg-laying apparatus, which it bears at the tip of the abdomen. The male resembles the female but lacks the ovipositor.

Many home growers are under the impression that the flies deposit their eggs in the blossoms, but that is not so. The flies lay their eggs within the developing fruits, particularly when they commence to ripen, and ripe fruit is very susceptible to infestation.

Life History.

The eggs, which are minute, are deposited to a depth of from 1/8 to 1/4 inch in the fruit, in punctures or "stings" made by the ovipositor of the female. The eggs, which are elongate and whitish, are usually placed closely together in small batches. They hatch in about two to three days, and infestation of the fruit soon becomes noticeable and the decay or "give" in the fruit can readily be detected by hand.

The legless larva or maggot, which measures about 1/3 inch in length when fully fed, is white to creamy white, and bears at its head-end a pair of small, black, hook-like jaws by means of which it burrows through the fruit tissues. The average period occupied by the larval stage is about twenty days. When fully fed the maggot crawls from the fruit and makes its way into the ground to a depth of 2 or 3 inches, and there its skin hardens and forms a small, elongate-oval puparium which is light brown in colour. The adult fly, which develops within this puparium forces its way through one end after an average period of twelve days, and makes its way up through the soil to the surface, where its wings soon expand and harden and it flies off. Eggs are not laid until about a week after emergence. The time occupied from egg to adult is about five weeks.



The Queensland Fruit Fly.

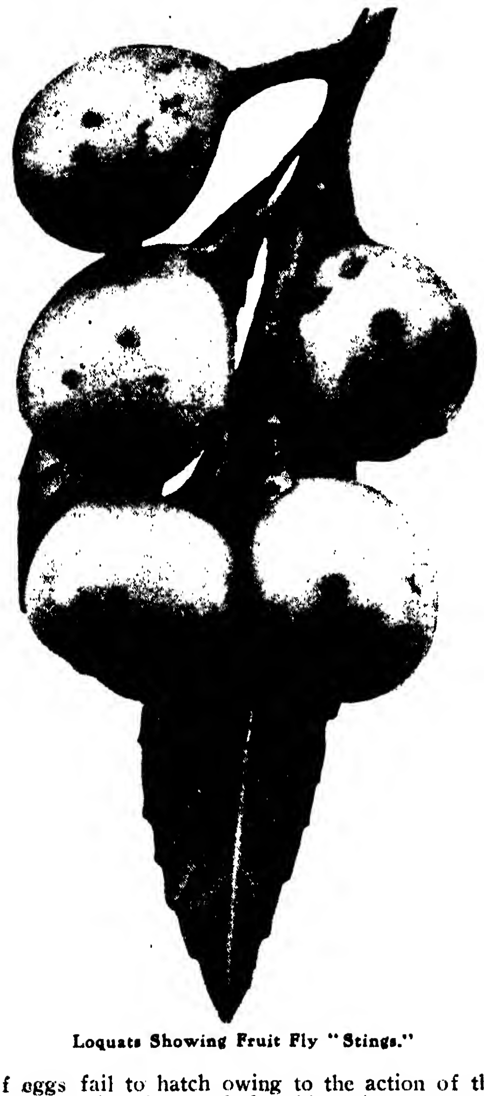
The adults continue to live and lay eggs for lengthy periods and four or five, or more, overlapping generations of flies may develop each year.

Fruit Fly "Stings."

The minute oval puncture or "sting," made by the ovipositor of the fly, may be readily seen with the aid of a lens. These "stings" affect the fruit in various ways. In peaches and nectarines

they are not very noticeable; in apples, pears and loquats a discoloured spot may develop around each puncture; while in persimmons a characteristic black spot develops about the site of the puncture. Passion fruits may develop hard, thickened areas where they are "stung."

Although citrus fruits generally are not infested to any great extent by fruit flies, more extensive losses may occur from the actual disfigurement or dropping of fruit, following the associated development of decay organisms. A large number



Loquats Showing Fruit Fly "Stings."

of eggs fail to hatch owing to the action of the oil from the glands of the skin. A pronounced hardening of the tissues surrounding the egg-cavities takes place, and this serves further to restrict the activities of the young maggots. In addition, maggots which succeed in hatching are usually unable to complete their development within the fruits, through failure to penetrate the albedo or inner portion of the rind to reach the pulp. Successive hatching of batches of eggs, laid within the same puncture, tend to break down this natural protection.

In some seasons the "stinging" of citrus is often followed by the development of an extensive, water-soaked area, which later becomes covered with a green mould. Lemons, in some instances, are often heavily "stung," but only rarely are maggots found to develop in them.

New Season Infestation.

This pest passes the winter in the adult stage, and on sunny days may be observed moving about the trees. Normally little breeding takes place during the winter, although occasionally maggots are found in second crop apples and citrus fruits.

Infestation for the new season usually commences in September and becomes still more evident in October. Loquats are considered to be the main host for this early infestation. A slight infestation of flies in early ripening loquats is of considerable importance, as this small population, arising from over-wintering flies, may serve to build up a severe infestation of the main loquat crop.

As citrus fruit or other fruit may also be infested to a very limited extent, and thus also provide a source of infestation, these should not be overlooked early in the season.

Some growers follow the practice of removing the immature fruit from odd loquat trees in order to obviate the necessity of carrying out control measures. This immature fruit may possibly contain fruit fly eggs, and care should be taken to ensure that no subsequent development takes place in the fruit on the ground, otherwise the whole purpose of the fruit removal will be defeated. This green fruit should be either boiled, burned or placed in a waste-fruit pit.

Control Measures.

The formulae for the foliage poison baits now prescribed are:—

(*a*)	Sodium fluosilicate	2 oz.
	White sugar	2½ lb.
	Water	4 gallons.
	or	
(*b*)	Tartar emetic	2 oz.
	White sugar	2½ lb.
	Water	4 gallons.

The sodium fluosilicate should be dissolved in practically the full quantity of water required. A vigorous stirring for about five minutes is necessary as the powder falls to the bottom of the container. Although sodium fluosilicate is more readily soluble in warm water, the quantity of water required is not appreciably less than when cold water is used.

Tartar emetic is readily soluble, and has been proved to be at least twice as efficient as sodium fluosilicate in killing the flies and is less likely to injure the foliage.

To Prepare Small Quantities.

Where only a few trees have to be baited, the following procedure will be found useful:—Dissolve 1 oz. of the poison in 1 gallon of water to make a stock poison solution. This solution

should be stored in a glass container, corked securely and labelled "POISON." When required for use take:—

1 pint of stock solution; *add*
1 pint of water, and
2½ ounces of sugar.

The quart of poison spray thus prepared will be sufficient to treat four to six trees, and the stock solution should suffice for the season's requirements for the average household orchard.

Application of the Poison Spray.

The treatment of the trees must commence at least five weeks before the normal time of the ripening of that particular variety of fruit, and the spray should be applied at weekly intervals until all fruit of that variety has been harvested or removed from the trees. In the case of the last variety to be harvested, the treatment must be continued for one month after all the fruit has been removed. On citrus trees the spray should be applied during the period of fly activity.

The spray is applied to two or more patches of the foliage, and at the rate of at least 6 fluid ounces to each tree. A pump or syringe may be used, but splashing with a large brush is also effective. Care should be taken, as far as possible, to avoid wetting or splashing the fruit. If rain falls soon after the application of the bait a second treatment should be given.

Destruction of Infested and Fallen Fruit.

All infested fruit (including tomatoes) must be removed from the trees and plants, and all fallen fruit (including tomatoes) must be collected from the ground at intervals not exceeding three days. All such fruit must be destroyed without delay either by boiling for at least ten minutes, or by burning or placing in a properly constructed fly-proof waste-fruit pit.

The daily collection and disposal of infested fruit, during periods of severe infestation, is becoming increasingly common in commercial orchards where growers realise the value of this control measure, and it is a method which cannot be too highly recommended.

Fly Traps.

Trapping has been discontinued under the Regulations, and the use of glass fly traps alone, therefore, does not now comply with the Act.

Other Compulsory Measures.

Other compulsory measures set out in the proclamation for areas specified in the Schedule are: All fruits of the main crop of Seville oranges, various varieties of mandarins and loquats must be removed from the trees by 31st October. In the same areas the intermediate crop of Seville oranges must be removed by 31st December. Elsewhere in the State the date specified is 15th December.

Codling Moth

(*Cydia pomonella.*)

THE codling moth is a perennial pest of apple, pear and quince trees, and if proper control measures are neglected, the losses to growers may become serious.

During the present month codling moths will commence to emerge from their cocoons. This emergence usually starts when the trees come into blossom, and may continue for three months, reaching a peak period during the latter half of November.

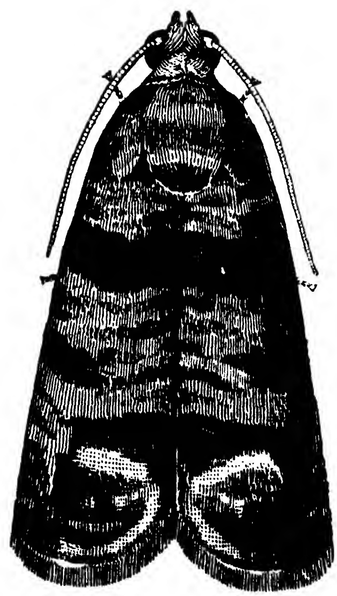
Some growers have the mistaken idea that calyx infestation arises from the actual laying of eggs in the blossoms, but this not so. Comparatively few moths are present in an orchard before the fruit is well-developed and the main drop has occurred. Calyx infestation can take place at any time during the growing period, and may be particularly severe in such varieties as Cleopatra and Democrat apples and most varieties of pears.

Description and Life History.

The adult is a small moth which measures slightly more than ½ inch across the outspread wings. The fore wings are brownish-grey, and there is a metallic, coppery-coloured patch near the tip of each; the hind wings are paler, being smoky-brown.

The eggs of the spring brood moths are laid on the leaves near the fruit, and as many as seventy-five eggs may be laid by an individual female.

The very small larvae or caterpillars, which emerge from these eggs, may feed a little on the green leaf tissues, but soon make their way



The Codling Moth in Resting Position.

to the young fruit. Some of these caterpillars enter the calyx end, but others enter elsewhere on the fruit. After feeding within the fruit for about four weeks, they crawl out and spin their cocoons on the branches or trunks of the trees. The first of these larvae enter their pupal or chrysalis stage during the first week in December, and others throughout December and January. The average length of the pupal stage of these midsummer pupae is fifteen days, and moths from these appear from about the middle of December onwards. These moths lay their eggs and the caterpillars which hatch from these attack the then well-grown apples, and continue to do so for the next few months.

The life-cycle of the codling moth, briefly, is as follows:—The incubation period of the eggs is 8-10 days, and the larval or caterpillar stage about 4 weeks. The larvae then spend 5-9 days in spinning their cocoons and changing to the pupal or chrysalis stage. The pupal stage of the spring brood caterpillars usually occupies 15 days or longer.

There are two main generations or broods each year, and the majority of the second brood larvae over-winter in that stage within their cocoons; these produce the spring brood of moths the following season. A third generation of larvae may be produced in the autumn by a very limited number of second-brood moths. The larvae of this generation also over-winter in their cocoons

The Calyx Spray.

Every effort should be made to eliminate the first brood of moths. The systematic thinning and removal of infested fruits will allow of more effective spraying and considerably reduce the number of moths in the second and third broods. Too much emphasis cannot be given to the importance of thorough spraying in the calyx and early cover sprays, as these determine definitely the success or failure of any codling moth control programme. The object of the calyx application is to place a deposit of lead arsenate within the calyx cup, so that the fruit will be safe from calyx infestation for the whole of the growing period. Failure to apply this spray thoroughly and at the correct period will necessitate additional sprays during the season if losses are to be kept to a minimum.

The calyx spray is the most effective of all codling moth sprays in achieving its purpose, and for this reason should not be neglected.

The correct time to apply this spray is when approximately 80 per cent. of the petals have fallen, and before the unfolding sepals have enclosed the calyx cavity. In most varieties of apples this enclosure takes place within a few days of petal fall, but with pears this may not occur, or may only take place after some weeks. As a considerable proportion of infestation in pears occurs through the calyx, a special effort should be made to build up a deposit of lead arsenate in the calyx cup. This objective is made easier of accomplishment by the fact that in many varieties of pears the first and second cover sprays are also, in effect, calyx sprays, as the cavity still remains open. At this later period the growing pears hang downwards and their calyces are more readily reached by the spray.

Growers are strongly advised not to spray too early—when the trees are in full bloom—but to wait until the majority of the petals have fallen.

Spraying too early gives poor results and endangers the lives of bees which frequent the blossoms at this stage.

The spray, which consists of lead arsenate powder 1½ lb. to 50 gallons of water, should be applied at a good pressure—at least 250 lb. per square inch—and with a nozzle giving a concentrated, coarse spray in preference to a mist. The addition of a spreader is recommended, but an excess should be avoided, otherwise too much run-off of the spray will occur. The amount of spreader required will vary with the hardness of the water used, but the average amount of the ordinary lime-casein type of spreader is 1 lb. to 100 gallons of spray.

In districts where black spot is also a problem, it may be advisable to combine lime-sulphur with the lead arsenate spray. Provided lime-sulphur is not used at a greater concentration than 1 in 80, this procedure is suitable for apples. Pears are more susceptible to lime-sulphur injury, and concentrations greater than 1 in 160 are not recommended at the calyx stage. Where the alternative fungicides, lime-sulphur 1 in 280 plus colloidal sulphur 1 lb. to 100 gallons or colloidal sulphur alone are used, the lead arsenate may be combined.

Care should be exercised in mixing lime-sulphur and lead arsenate sprays, otherwise a blackening of the mixture will occur, with subsequent deterioration of the spray and increased risk of spray injury. The usual procedure is to mix the quantity of lead arsenate required with either twice its weight of hydrated lime or with lime-casein spreader at the rate of 1 lb. per 100 gallons of spray. Whichever mixture is used, it is first made into a thin paste with a small quantity of water and then added to the diluted lime-sulphur solution. Spraying should then be commenced without undue delay.

This procedure may be varied, providing the lime-sulphur is not mixed with the lead arsenate prior to the addition of the hydrated lime or lime-casein. It is for this reason that it is advisable to mix the lead arsenate and lime or lead arsenate and spreader, as a preliminary to the preparation of a safe combination spray. If leaf-hoppers are present nicotine sulphate (1 pint to 75 gallons) may also be added to the mixture.

When spraying, the entire tree should be sprayed from the inside as well as the outside, and particular attention should be given to the tops of the trees, as the majority of codling moth eggs are laid on the leaves in the upper part of the tree, where most of the fruit is also borne.

Control Measures are Compulsory.

Measures for the control of codling moth are compulsory under the Plant Diseases Act, and in addition to the calyx spray discussed above, apples, pears and quinces require further arsenate of lead sprays. These later cover sprays must be repeated at intervals not exceeding three weeks until the whole of the fruit has been removed from the trees. In some districts four applications of spray are sufficient.

The efficiency of the lead arsenate spray is increased by the addition of white oil emulsion

at the rate of ¾ to 1 gallon to 100 gallons of spray mixture.* This white oil should not be used in more than three sprays, and it is generally combined with the second, third and fourth cover sprays. The white oil emulsion, in addition to giving a better covering of lead arsenate, also kills codling moth eggs.

Fruits approaching maturity must not be overloaded with lead arsenate or they will not comply with health regulations, and also an undesirable blotching will occur on highly coloured fruits.

White oil must not be used immediately following lime-sulphur spray, and an interval of three to four weeks between these sprays is recommended.

Infested and Waste Fruit.

Other measures which are compulsory are the removal from the trees of all infested fruits and the collection of all fallen fruit. This must be done at intervals not exceeding seven days, and the fruits destroyed either by immersing in boiling water for ten minutes, by burning thoroughly, or else by placing in a suitably constructed waste-fruit pit, from which insects cannot escape. In some districts waste-fruit pits are compulsory for the destruction of infested fruit, but their use can be recommended in all orchards, on account of their convenience and effectiveness. A pit 6 feet by 5 feet, with a depth of 6 feet, when filled, will hold approximately 144 bushels of waste fruit.

Bandaging.

Bandaging, although not compulsory in all districts, is a valuable supplementary control measure. Two kinds of bandages are in use—the chemically-treated bands† and the sacking bandages. The chemically-treated bands consist of corrugated strawboard impregnated with beta-naphthol and oil. The sacking bandage is made of twill sacking about 8 inches in width, folded once with the opening of the fold facing downwards.

The bandages are placed around the trunk and around every limb which rises less than 5 inches from the ground, and should not be allowed to touch the ground. The bandages should be kept in position from 15th November until at least 1st June of the following year, and are to be removed not later than 31st July.

The chemically-treated bands require no attention until the time of their removal, when they should be burnt. These bands should be removed carefully, as numbers of the grubs will be found against the tree and may fall to the ground as the band is removed and the cocoons torn. Many live grubs will be found in these bands in June or July, as the bands lose much of their toxicity after long exposure. The killing of grubs or prevention of moth emergence until the end of February is all that is expected of this type of band. Chemical bands are most conveniently disposed of by burning in a tin burner, suitably made to carry from tree to tree. The oil-soaked bands burn readily and all grubs and litter are destroyed immediately.

Where the sacking bandages are used they must be undone and examined every fortnight until 21st February, and all sheltering larvae or pupae in cocoons found within removed and destroyed, the bandages then being replaced. After the end of February they may be kept in place until removed in June or July.

Additional Control Measures.

Another important measure which serves further to reduce codling moth infestation, is the destruction of over-wintering grubs. The trees should be scraped free of loose bark, and all cracks and crevices should be examined for sheltering grubs. All larvae and pupae and litter from such sources should be burnt. Broken branches should be removed, and all likely cocooning places filled with a putty or similar substance. In some districts numbers of grubs may be found about the trunks of the trees and an inch or two below soil level. The soil should be scraped away and any larvae or cocoons found destroyed. During harvesting a large quantity of infested fruit may be picked into store boxes, and as the grubs over-winter readily in such boxes, some treatment will be necessary to check this source of carry-over. Dipping the boxes in boiling water for a period of three minutes has been found quite satisfactory. Where the packing shed has been made moth-proof, the boxes may be stored without treatment. Where second-hand cases are used, dipping in boiling water for three minutes is an important precaution against re-infestation of the orchard. The woodwork of graders, benches, etc., should be carefully examined and all grubs destroyed.

Codling moths tend to collect about windows in their efforts to leave the packing shed, and a check can easily be made on the emergence in the shed by periodical examinations. Emergence in the shed is somewhat later than in the orchard, the maximum emergence of spring-brood moths from this source occurring about the end of November. The moths may be destroyed at the windows or may be caught in shallow pans containing a mixture of molasses (1 fluid ounce) and water (9 fluid ounces).

* For the preparation of small quantities of spray the amount of materials required are approximately as follows:—Arsenate o lead, 2 oz.; water, 4 gallons. Where the white oil emulsion is to be added the amount required is approximately 3 fluid oz. to every 4 gallons of spray mixture.

† Chemically treated bands should not be placed on young, smooth-barked trees without first protecting the part to be covered with a coating of whitewash or suitable bituminous paint.

Tamworth District War Agricultural Committee has successfully organised volunteer week-end labour for rabbit destruction. Fifteen men were recently engaged on a property at Loomberah, and about twenty large warrens covering an area of about 50 acres were dug out. The men were paid £1 each for the day, and very satisfactory work was done.

Keep On Buying War Savings Certificates.

THE INTRODUCTION OF BROOD.

A Means of Overcoming Many Problems.

ONE of the most important operations in modern bee-farming practice is the introduction, when desired, of a frame of bees from a progressive to a needy colony. This work, which may require to be done at any time throughout the active season as a ready way out of one of many difficulties, is made possible by the use of standardised frame hives. It is a simple manipulation, but must not be carried out in a haphazard fashion. It is necessary, in particular, to ensure that, in the exchange of combs from one hive to another, brood disease is not present in the transferred comb; otherwise foul brood (*Bacillus larvae*) **may be spread throughout the apiary.**

When Establishing Nuclei Colonies.

Nuclei colonies made up to replace losses early this season will be greatly assisted to a sound footing for the productive months ahead, if each colony is given a comb of brood on which it is observed that young bees are freely emerging, or, as an alternative, a comb of brood containing a good percentage of sealed brood together with adhering bees. Either may be placed directly in the brood-nest of the small colony. Such combs and bees should be drawn from populous hives in a position to spare them; in fact, if the brood and bees are drawn from hives where there is a congestion of young bees—a likely cause of swarming—the very useful dual purpose of minimising the development of swarming tendencies and providing assistance to the nuclei, will be served.

Brood for the Queenless Hive.

In the case of a bee-farmer finding an apparently queenless colony—evidenced by the lack of brood in the hive and the tendency of the bees to pack the brood-nest with pollen—the introduction of a comb of brood containing some eggs or very young larvae will assist the colony to maintain its strength, and will give the bees an opportunity to raise queen-cells from the eggs or young larvae introduced to the hive. The raising of royal cells from this brood is sufficient evidence of a queenless condition, and if, within eight to nine days time the cells are destroyed, a queen raised under better conditions may be introduced to the hive. However, in the smaller apiaries, it may be found that a queen bee is not available for such emergency introduction, and

that it is necessary to allow the colony to carry on with a couple of the best developed cells to produce a queen of its own.

There are occasions, also, where a hive is found to contain a fairly good strength of bees and sealed brood, and also indications that a young queen has emerged from a queen cell, and yet, after careful search the queen cannot be located. In this instance the introduction of brood with eggs and larvae will enable the beekeeper to determine whether a queen is, in fact, present. A virgin queen bee a day or two old is rather small and very "shy"; in consequence it is very easy to miss finding her during an examination. A further search in ten to twelve days time to see whether she has commenced to lay eggs may even prove inconclusive. It is not safe, therefore, to attempt introduction of another queen until a test is made by giving some brood. If a queen is not present, the bees will commence raising queen cells.

Introducing Brood to a Newly-hived Swarm.

When hiving a swarm of bees, it is recommended that a comb of brood containing some eggs and larvae, not necessarily a fully established one, be placed in the new home prepared for the bees. This will induce the swarm, when hived, to settle down to work readily, as the incubation and feeding of the young brood demand the almost immediate attention of nurse bees. The remainder of the frames in the new hive should contain comb-foundation only, as the swarm is all prepared for home-building, and is not expecting a home all furnished with built-out combs. Neither will the bees appreciate such assistance, as they are seeking a home where there is plenty of room for expansion. These points should be kept well in mind during October and early November, the period in most districts when swarming is likely to occur.

The Dumaree-Miller Plan to Control Swarming.

The Dumaree-Miller plan to control swarming, as practised extensively in other countries, is described in the latest edition of the "A.B.C. and X.Y.Z. of Bee Culture" (Root). The queen of a populous colony likely to swarm is transferred, with a frame of her brood and bees, to a new hive-body, and empty brood combs, or frames fitted with comb-foundation are inserted to make up the full complement of frames. In the readjustment of the hive, the new brood-chamber is placed on the bottom board, a queen excluder put over it, then the honey super, and over all, the old brood chamber with its brood and bees, now to act as a super. In ten days time the brood upstairs is examined and any queen-cells destroyed, although under favourable conditions this operation may not be necessary.

A good deal of success attends this plan, even when a colony is found with advanced queen-cells prepared for swarming. All such cells must, of course, be destroyed before the hive is manipulated.

In some countries, particularly in clover regions, bee-farmers make a practice of "Dumareeing" all populous hives as a swarm-control measure, but in Australia the plan is more or less limited in its application to individual stocks most likely to develop swarming tendency. It is considered, however, that the Dumaree-Miller plan, as described, could be extended with advantage in some of our areas, together with the general provisions of ample hive-accommodation and the working of young queen bees, where swarming problems are most difficult to overcome.

Diagram Showing Construction of Frame Groove Cleaner.

In the application of this plan to control swarming, the transfer of a frame of brood together with adhering bees, is involved—in this case, from one section of the hive to another, and the queen is also transferred.

Transfer of Brood from Bee Trees.

When transferring bees obtained from bee-trees, to a properly-constructed hive, it will prove advantageous to fit cuts of worker-brood from the tree securely and neatly into one or two empty frames. This will facilitate establishment of the colony in the frame hive. Narrow rubber bands cut from an old bicycle or motor-tube will be found a convenient means of holding the pieces of brood in position in the frames until the bees join them securely. Specially manufactured transferring wires for this purpose may be obtained from the factory, or, as a last resource, pieces of reasonably strong string may be used.

Poisoning of Bees Interferes with the National Economy

THE British Ministry of Agriculture has asked the National Farmers' Union in Great Britain to draw the attention of members to the danger of using arsenical sprays on open blossoms and thus: (1) poisoning honey-bees which are responsible for the pollination of at least half the fruit trees in the country; and (2) destroying 90 per cent. of all pollinating insects visiting the flowers.


Using the Frame Groove Cleaner.

Two simple precautions are advised:—(1) Use arsenical sprays only before flower buds open and immediately after the petals have fallen; (2) cut and remove dandelions and flowering weeds beneath trees before spraying.

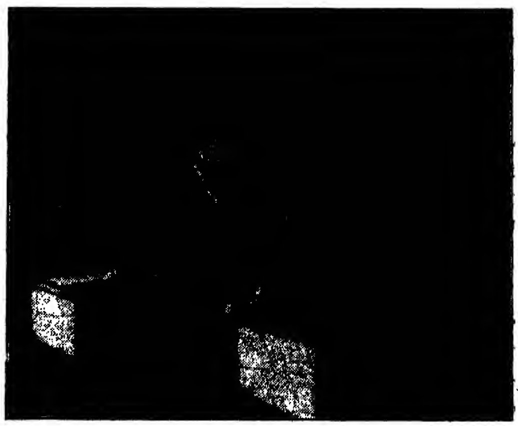
An interesting article on this subject by C. G. Butler, Rothamsted Experimental Station, England, appeared in a recent issue of *Nature*. The following is an extract from it:—"From a beekeeper's point of view, honey production is the main object of beekeeping; but from the national point of view ....both in peace and war, the chief contribution of beekeeping to the national economy is the provision of pollinators for crops such as fruit, clover, etc.

"It has been recently estimated that the approximate cash value of the honey-bee to the nation as pollinator of fruit crops alone is £4,000,000 per annum, and an average of about £1,250,000 worth of honey is produced annually."

A Useful Frame Groove Cleaning Implement.

WHEN readjusting frames from which cull or damaged combs have been cut, it is usually found that the thorough cleaning out of the groove, in the popular single-groove frame, is quite a troublesome job. However, by the use of the groove cleaner illustrated, a usful little implement designed by Mr. E. W. Robertson, of Chatswood, the perfect cleaning of the groove is rendered quite simple. The implement may be made from a piece of, say, No. 8 steel fencing wire. One end is turned at right angles about ½ inch, and this end sharpened to a wedge shape. About ½ inch back from this bend, with the blade pointed downward, bend the wire to the right, and then, allowing a further clear ½ inch back along the wire, bend to the left so as to bring the main portion of the wire parallel to the original line of direction (see sketch). These right-angled turns provide for the pull on the cleaner blade being made from outside the edge of the frame. A handle is made for the cleaner by plugging a short piece of piping with wood and driving the free end of the wire into it.

Mr. Robertson has been keeping bees for many years, though not on a commercial basis, and reference was made some time ago to the bent-handle transferring needle


Mr. E. W. Robertson Interested in the Work of One of His Imported Queens.

which he uses in queen-rearing work. Just prior to the United States of America entering the war, Mr. Robertson arranged two successful importations of queen-bees by air mail from that country.

SPIROCHAETOSIS (Tick Fever) IN POULTRY.

F. H. W. MORLEY, B.V.Sc., H.D.A., Veterinary Officer.

OUTBREAKS of fowl tick fever have occurred recently in County Cumberland, causing heavy losses—in one case over 500 adult birds out of 1,600. Many people are under the impression that this disease is confined to the country west of the mountains, but these and other previous cases have shown that it may become a serious problem on the coast unless preventive measures are adopted.

Tick fever (spirochaetosis) is caused by an organism which enters the blood stream and causes rapid death in a large proportion of affected birds, and extreme loss of condition in many others. This organism may be carried by various insects, ticks and mites, but the most important carrier is the fowl tick (*Argas persicus*) which is common in the inland areas, but, as far as is known, is uncommon on the coast. Almost every outbreak observed so far in the Metropolitan area has been found to result from the introduction of the fowl tick either on birds, or on crates brought home from the poultry markets. Once on the farm the organism may spread from bird to bird by ticks, red mites or even mosquitoes.

Symptoms.

Drowsiness, weakness, green diarrhoea in many cases, great thirst, darkening of the comb and death in 12 to 24 hours are typical symptoms of acute cases. Symptoms seen in mild cases are paralysis, loss of appetite, wasting, thirst, and sometimes recovery in a few days.

Post-Mortem Changes.

These are most marked in the liver, which shows enlargement, flabbiness and small patches of grey substance right through the organ, and the spleen, which may show white, soft, sago-like granules right through its substance, and the organ is generally extremely enlarged.

Diagnosis.

Where this disease is suspected, a careful search for ticks should be made under perches, in cracks in wood, in the overlap between sheets of iron, under rafters, under the bark of trees and in any other places where a tick is likely to seek protection.

The tick is extremely difficult to find, so that even if not found at first it is still quite possible for considerable numbers to be present. If ticks are not found, it is possible that the disease may have been carried by red mites or insects. For certain diagnosis, it is best to consult a veterinary surgeon or send live birds to the Veterinary Research Station at Glenfield for laboratory examination.

Control.

As treatment is difficult, unsatisfactory and very expensive, methods of prevention and eradication should be given consideration.

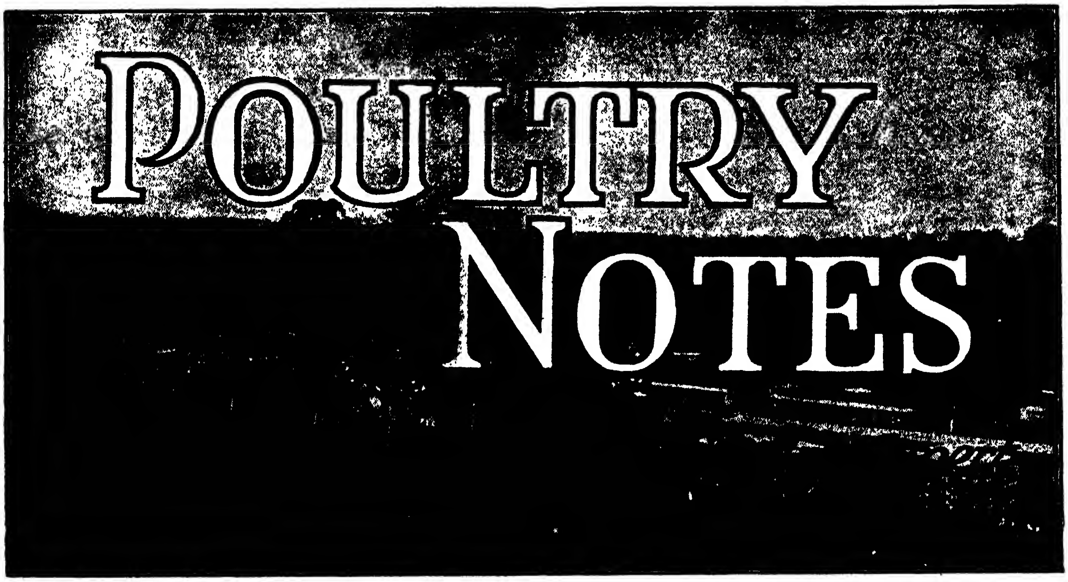
1. Do not purchase birds from areas known to be infected or where the fowl tick is known to be present.

If birds are introduced to the farm they should preferably be kept in separate coops for eight to ten days with a wire netting floor under which is a tray containing water covered with kerosene—or a tray or shavings which are subsequently burned may be used instead.

2. Crates that have been sent off the farm should be disinfected before they are brought back. Treatment must be thorough or it is not worth while; if only a few ticks are missed, losses will continue. The best materials to use are sump oil, kerosene emulsion, wood preserving oil or a strong solution of sheep dip. The crates should be sprayed all over, particular attention being given to cracks, crevices and corners. Treatment should be repeated every time crates are brought home from market.

Eradication of the disease requires the eradication of ticks and mites. This is possible by thorough treatment of all houses, nest-boxes and all places capable of harbouring ticks or mites. Old, cracked or ant-eaten timber is best discarded and burned as any method of disinfection of this material is unsatisfactory. Kerosene emulsion, etc., should be used and the treatment repeated several times at intervals of five days until losses have ceased and the

(*Continued on page* 491.)



POULTRY NUTRITION.

MANY unsound theories and false ideas are current in regard to the feeding of poultry. Numerous poultry farmers, even in normal times, because they have been told that certain items will increase egg production, feed rations which are unnecessarily costly. They use these items in the ration for the whole flock without endeavouring to obtain proof of their merits, if any. To feed poultry successfully and economically it is necessary that the farmer should clearly understand the principles of the nutrition of poultry.

There are, of course, many different rations which can be used, and which will give good results, provided they are suitably balanced. To be satisfactory, a ration should supply the materials essential for all body functions, and, in addition, a surplus, which in the case of the hen is converted into eggs.

Poultry Food Constituents.

The main constituents required are: Nitrogenous compounds, such as proteins; non-nitrogenous compounds in the form of sugar, starches, fats, oils, etc.; and minerals such as salts (sulphates, phosphates, etc.) of sodium, calcium and potassium. In addition, in most foodstuffs there is also a residue of fibre—of which very little is digested by poultry.

The proteins contain hydrogen, nitrogen, oxygen and carbon, which are required to replace body tissues. They form skin, muscle, blood, feathers and a large portion of the egg. Two main types of protein are used in poultry rations, viz., protein of animal origin such as meat meal, and vegetable protein, in the form of linseed meal, soybean meal, etc. The animal proteins are considered to be of higher value for poultry feeding than those of vegetable origin.

Carbohydrates are composed of hydrogen. oxygen and carbon and supply body heat and energy. Any excess of carbohydrates is converted to fat and stored in the body.

Albumenoid Ratio.

The albumenoid or nutritive ratio is the proportion which the protein content of a food bears to the carbohydrates plus fats. As fats contain approximately 2¼ times the heating value of carbohydrates, the amount of fat multiplied by 2¼ gives the carbohydrate value.

It is generally recognised that a properly balanced ration for adult fowls should have a nutritive ratio of from 1 : 4.5 to 1 : 5. If we take as an example the standard ration advocated by the Department for feeding adult poultry, the nutritive ratio would work out as follows:—

Foodstuffs.		Proteins.	Carbo-hydrates.	Fats.
Pollard	60 lb.	9·2	35·0	2·4
Bran	33½ „	5·2	18·0	1·0
Meat meal ...	6½ „	3·6	0·26	0·72
Wheat	67 „	7·1	47·9	1·3
Maize	33 „	3·8	22·6	1·4
	...	28·9	123·76	6·82

$$6{\cdot}82 \times 2{\cdot}25 + 123{\cdot}76 = 139{\cdot}16.$$

$$\frac{139{\cdot}16}{28{\cdot}9} = 4{\cdot}8.$$

Bran and Pollard Becoming More Plentiful.

Now that supplies of pollard and bran are becoming more plentiful, due to large export orders for flour, poultry farmers should use these offals to the maximum extent possible in order to cheapen costs of feeding. It is estimated that the adoption of the normal, simple ration, advocated by the Department for use when pollard and bran are plentiful, would cheapen the cost of feeding by at least 1s. per hen per year, compared with the rations which poultry farmers are compelled to use at present.

Details of the composition of this ration for adult birds, used by the Department and fed to the birds in the Hawkesbury College egg-laying competition is as follows:—

Morning.

Wet Mash.	lb.
Pollard	60
Bran	33½
Meat meal	6½
	100 lb.
	oz.
Salt for wet mash	22
Salt for dry mash	16

Midday.

Greenfeed.

Afternoon Feed.	lb.
Wheat	67
*Maize	33

* On account of the high price of maize this item could be reduced or entirely replaced by wheat.

Feeding Chickens.

OWING to the difficulty of securing supplies of dried milk products, such as skim milk powder, butter milk powder, etc., many inquiries are received concerning the use of substitutes for inclusion in the mash for feeding chickens.

In the absence of these milk products, or liquid skim milk, the only suitable substitute is meat meal, and the composition of the mash for chickens up to 12 weeks of age could be as under:—

	lb.
Pollard	16
Bran	7½
Meat meal	¾
Bone meal	¾
	25 lb.
	oz.
Salt for wet mash	5
Salt for dry mash	4

When fed as a wet mash—

Chickens up to 6 weeks of age should be given four feeds per day of the mash at regular intervals, and one feed of grain chicken mixture about an hour before sunset.

From 6 weeks to 12 weeks, three feeds of mash and one feed of wheat and cracked maize late in the afternoon.

After 12 weeks and until fully grown, two feeds of mash and one feed of grain—wheat and maize, the proportions being varied according to the price of maize. One of the mash feeds should be the same as for adult birds as set out previously, and the other consist of pollard, bran and salt only, or if desired, green feed can be added to the extent of one-third by measure at first, and, as the birds reach maturity, can be increased and the pollard and bran decreased so that when 8 to 9 months old they would receive mostly green feed at midday.

Dry Mash Feeding.

The same mash can be fed dry with the reduction indicated in the amount of salt, but better results will be secured by feeding wet mash, or at least one or two feeds of wet mash per day in addition to the dry.

War Agricultural Committees and the Poultry Farmer.*

BECAUSE of the demand for increased production of eggs and poultry, the War Agricultural Committee organisation has a special significance for poultry farmers. It would appear that many poultry farmers are inclined to look upon this organisation as one which deals with agricultural problems in distant country areas. There are many reasons, however, why every centre should have its local war agricultural committee.

The set up of this organisation is that there are forty-four District Agricultural Committees (each comprising several shires) throughout the State, and hundreds of local committees. The committees deal with primary producers' requirements such as labour, transport, machinery, tyres, spare parts, ammunition, etc.—in fact, with all aids to production which the farmer as an individual finds it most difficult—impossible in the case of controlled items—to obtain.

These committees have been established at the request of the Federal Government and operate under the State Department of Agriculture (as agent for the Federal authorities). The members of the District War Agricultural Committees are appointed by the Minister for Agriculture, the Chairman being a field officer of the Department of Agriculture. All other district field officers of the Department are ex-officio members of War Agricultural Committees (District and local), and the National Service Officer is also an ex-officio member.

Local War Agricultural Committees.

However, poultry farmers are more interested in the work and formation of local war agricultural committees. Every locality should have a local committee. In some districts it has been found advisable also to have industry committees, working as sub-committees, examples being the Vegetable Industry Committee in the Murrumbidgee Irrigation Area and the Cane Growers'

* Supplied by the Executive Officer, N.S.W. War Agricultural Committees.

Committees in the Northern Rivers Area. The area to be covered by a local committee should be a matter of mutual arrangement between localities concerned, and should be clearly defined. The method of forming a local committee is for a responsible person to convene a public meeting, under authority from the D.W.A.C., at which the local people will elect the members of the local committee. No definite ruling has been made as to the personnel of such a committee, but each such committee should make a local by-law defining that point; nor has any ruling been made as to the life of a local committee. Each local committee is entitled to make a by-law on that point.

The following expenses are payable to local committees:—

1. They are supplied with stationery and stamps through the District Committee. Telephone calls may be paid through the D.W.A.C.
2. Out-of-pocket expenses for petrol and oil, for any travelling done at the request of or on behalf of the District Committee.
3. In cases in which a local committeeman is unavoidably required to incur hotel expenses when undertaking work at the specific request of the District Chairman, he is entitled to out-of-pocket expenses for meals and for bed.

All accounts under these headings will be submitted to the D.W.A.C., and must be certified by the D.W.A.C. Chairman.

It is the function of the local committee to serve as part of the national machinery to implement the nationally planned agricultural programme, and, in particular, to organise its own locality's share of the food front by dealing with such problems as a stepped-up production programme may require. In general all local problems and tasks that can be handled locally, should be the responsibility of the local committee. In the absence of a local committee which is familiar with requirements of the particular locality, delays are likely to occur in referring matters to the District War Agricultural Committee which may be situated at a centre some considerable distance away.

To perform such a function calls for the exercise of public spirit, mutual help and co-operation in the national interest. It should be the constant care both of the District and of the local committees that the whole should work as a co-operative machine. Organisers have now been appointed and they will assist in developing that understanding between the District Committee and its local committees which will ensure that each shall play its full and responsible part as a member of a co-operative team.

Members of existing associations and other local bodies in poultry farming districts should form themselves into local War Agricultural Committees or, where no such association exists, leading poultry farmers should organise a committee. Those desiring further information on the establishment of these Committees should contact the Executive Officer, N.S.W. War Agricultural Committees, Department of Agriculture, Box 36A, G.P.O., Sydney.

The Menace of Lice Infestation of Sheep.

IN a number of the reports received from Veterinary Officers and Inspectors of Stock in recent months, attention has been drawn to the apparent increase in the extent to which sheep are infested with lice.

During the last eighteen months or so, the veterinary and inspectorial staffs have been required to devote much time to matters arising directly out of the war situation and for some time the amount of inspection carried out for lice in sheep has been considerably reduced. It is also, of course, realised that the sheepowners are faced with difficulties in connection with the labour problem.

However, it is desired to draw the attention of sheep men to the fact that the lice can bring about a very serious diminution in the wool clip and in the condition of the sheep. An instance has recently come to light in which the inspector reported that on a number of sheep seen by him the loss in wool on the belly and sides amounted to 75 per cent. Owing to the control which has been exercised in recent years, it is probable that many sheep men have not seen the damage which lice can do if they are allowed to propagate without control.

In view of the urgency of maintaining wool and meat supplies, it would be very desirable if the industry as a whole took cognisance of the situation and made every effort to arrange for dipping to be carried out wherever it is necessary.

Judging from recent reports, some stockowners are not aware that lice infestation in sheep is a notifiable disease. Failure to report the presence of lice to the Inspector of Stock renders the owner or person in charge of the sheep liable to prosecution.—MAX HENRY, Chief, Division of Animal Industry.

THE advantages of dehorning cattle have been the subject of frequent emphasis in information recently published by the Department of Agriculture. It is of interest to note that in England the practice is receiving increasing attention. The National Farmers' Union has asked its members to consider dehorning all non-pedigree male calves, except those being reared for service, during the first fortnight after birth, preferably when the calves are under five days old.

The prevention of the growth of horns in calves by cauterisation of the horn bud and the methods of dehorning adult cattle are discussed in detail in a pamphlet entitled "The Dehorning of Cattle," obtainable free on application to the Department of Agriculture, Box 36A, G.P.O., Sydney.—MAX HENRY, Chief, Division of Animal Industry.

INTERNAL PARASITES OF CATTLE

May Cause Heavy Losses in Calves.

T. G. HUNGERFORD, B.V.Sc., H.D.A., Veterinary Officer.

WORM infestation is frequently a cause of serious trouble in young stock in the coast districts of New South Wales. Particularly in wet seasons young animals poorly nourished, kept on the same, overstocked ground, or kept in swampy areas may show serious symptoms of worm infestation. Some of the more important internal parasites of cattle in New South Wales are described in the following article. Many of these also affect sheep.

Nutrition Must Be Adequate.

Young cattle become infested with worms mainly during the warmer months of the year, but may not show the effects of infestation until winter or early spring. It is a dangerous fallacy to think that a mere campaign of drenching will be sufficient to control them. The nutrition of the calf must be adequate, wet marshy pasture conditions must be avoided, and the calves should not be kept on one permanent calf paddock, as this will become heavily infested with worm eggs. Small temporary calf yards rotated on some area to which cattle do not have access, *e.g.*, a crop paddock, are most suitable.

Make sure that the calf has its mother's milk for the first four days, and thereafter whole milk for three weeks. If skim milk is fed, add 1 ounce of cod liver oil to replace the Vitamin A which is removed with the butter-fat. Good grazing and a suitable concentrate mixture should be available to the calf.

Parasites of the Fourth Stomach.

LARGE STOMACH WORM (*Haemonchus contortus*).

This is usually the most important parasite of young cattle up to 18 months of age. Affected stock are weak and will not travel fast or far. The calf has a rough dry coat, and the mucous membrane of the eye and mouth lose their pink colour, becoming pale or white. A dropsical swelling may occur under the jaw, and under the belly in some cases.

Calf Heavily Infested with Worms.

Note poor condition, rough coat, dull dejected appearance, and pronounced swelling under the jaws.

[*After Roberts.*

Treatment.

Phenothiazine.—The dose for mature cattle is up to 2 ounces; twelve months old cattle, up to 1½ oz.; six months old, 1 oz.; calf, four months old, ½ oz. The drug may be sold as a powder, in which case it may be mixed with water and the cattle drenched with it. Alternatively, it may be mixed with the feed. Obviously the maker's directions should be followed, as from time to time the form in which it is put up may vary.

The form in which it is given is merely a matter of convenience. If given as a watery suspension, make sure to keep it well stirred. Very poor cattle should have the dose cut down, as cattle are not very tolerant of the drug. Prior starving is unnecessary.

Tetrachlorethylene.—This is mixed with an equal quantity of liquid paraffin, and given after a preliminary dose of half a cup of 5 per cent. solution of baking soda (1 oz. to the pint). This ensures the tetrachlorethylene going direct into the fourth stomach.

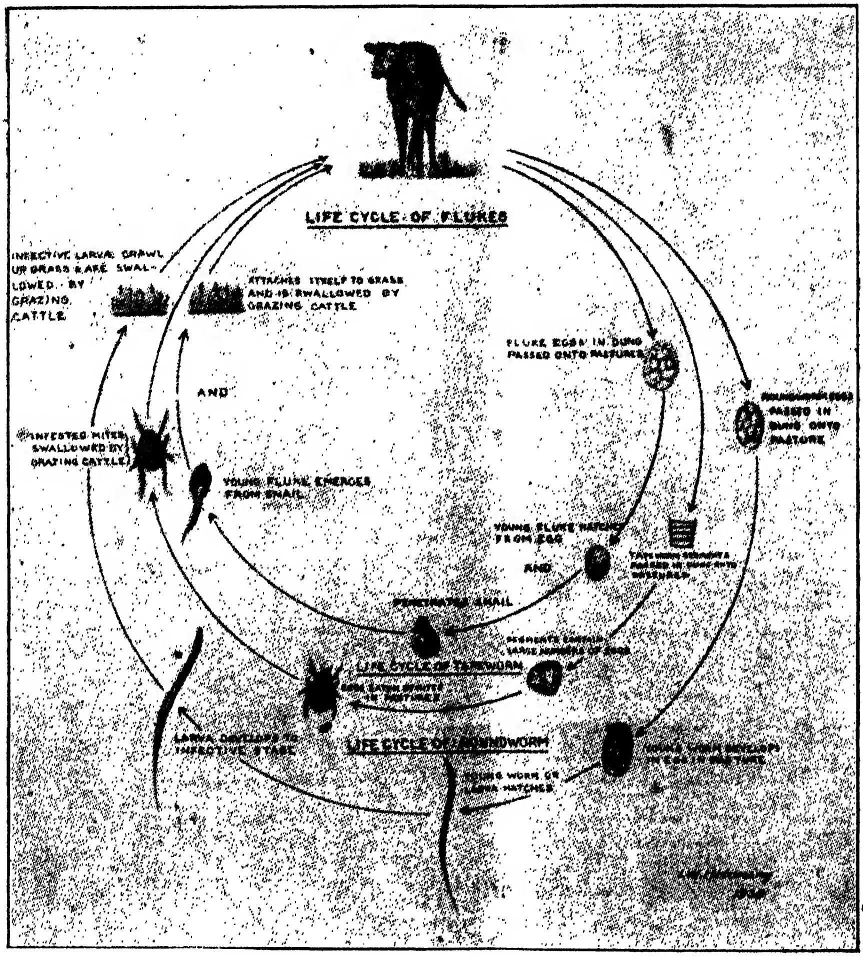
The dose of the mixture is as follows:—

Age.	Dose.
2 to 4 months	12 c.c.
4 to 8 months	17 c.c.
8 to 12 months	22 c.c.
12 to 18 months	27 c.c.

(Note that 30 c.c. = 1 oz. roughly.)

Bluestone-Nicotine Sulphate.—The mixture is bluestone, 1 lb.; nicotine sulphate, 16 fl. oz.; water, 5 gallons; and the dose 2 fl. oz. per. 100 lb. body weight. A maximum dose should not exceed 4 fl. oz.

Bluestone-Arsenic.—The ingredients are bluestone, 1 lb.; arsenite of soda, 4 oz.; spirits of salts, 3 fl. oz.; water, 2 gallons. The dose is 10 c.c. (1/3rd ounce) per 100 lb. body weight, but the total dose should never exceed 2 fl. oz.



How Cattle Become Infested with Worms.

1.—Permanent pastures. 2.—Damp marshy pastures. 3.—Overstocking. 4.—Haphazard calf-rearing. 5.—Poor nutritive conditions. 6.—Unhygienic calf pens and yards. [*After Roberts.*

Bluestone.—The constituents are bluestone, 1 lb.; water, 2½ gallons. The dose varies from 1½ oz. at 2 months old to 5 oz. at 18 months (4 to 8 months, 2 to 3 fl. oz.; 8 to 12 months, 3 to 4 fl. oz.). This drench is not as effective as the others.

Prior starvation is not required before giving any of the above drenches.

When worms are bad it may be necessary to drench twice or several times at intervals of ten to fourteen days. Drenching may be carried out by means of a drenching funnel, from bottles, or with a drenching gun. In any case make sure the dose measurement is correct, and drench slowly and carefully. Prevent the animals having access to water for several hours after drenching.

Small Brown Stomach Worm or Lesser Stomach Worm (*Ostertagia ostertagi*).

This worm is small, thin, and hair like, and is found in the fourth stomach. It is most easily seen by scraping the stomach wall, and examining the scrapings in a glass dish held over a dark background. It causes gastritis, diarrhoea and wasting.

Phenothiazine, tetrachlorethylene, and bluestone-nicotine sulphate, as recommended for the large stomach worm, are effective in the treatment of this worm also.

Stomach Hair Worm (*Trichostrongylus axei*).

This worm is about ½ inch long and very slender or hair like. It occurs in the fourth stomach, but is probably not very common. Treatment is as for the small brown stomach worm.

Worms of the Small Intestine.

Nematodirus cooperia.

These are small, hair-like worms which vary in length from 1/3 inch to 1 inch. They may be detected in the same manner as the small hair worm. Typically they cause scouring, while anaemia is not so marked as in the case of the large stomach worm. Treatment as for small stomach worm is effective.

Hookworm (*Bunostomum phlebotomum*).

It is not known how common hookworm is in cattle in this State, but it is a serious parasite in Queensland. It occurs in the first part of the small intestine, is stout, white, easily seen, and adheres firmly to the intestinal wall. Its effects on the cattle are serious and are similar to those produced by the large stomach worm.

Moist sandy pastures, and overstocking, favour infestation with this parasite.

Treatment with tetrachlorethylene (see large stomach worm) or with carbon tetrachloride (see liver fluke) might be tried.

Conical Fluke (*Paramphistomum* spp.).

This is really a parasite of the second stomach and paunch. The immature forms, however, become attached to the wall of the small intestine, and may cause serious inflammation, and a severe, dark-coloured evil-smelling diarrhoea. Young stock become pale, weak, and unthrifty, and bad cases may die. Anaemia and dropsical swelling under the jaw may be noted, as in the case of infestation with the large stomach worm.

Control consists of keeping the calves out of wet or marshy areas, and by maintaining their state of nutrition. Methods recommended for the control of liver fluke (a separate Departmental pamphlet dealing with this subject is available on application to the Department) will also be applicable to the destruction of the snail which acts as the intermediate host of this parasite.

Large Stomach Worm.
(Natural size.) *After Roberts.*

Tapeworms.

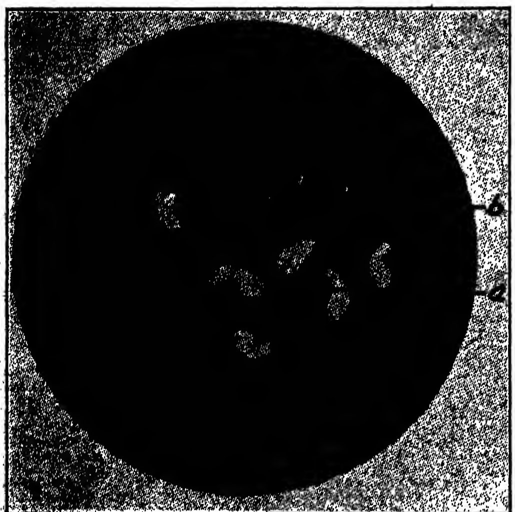
Three main species of adult tapeworms occur, the commonest of which is *Moniezia benedini*. These are found in the small intestines, and are usually seen only in young animals. Usually they cause no ill effects, but the harmful effects of other parasites are readily attributed to them, as their large size (they reach up to 15 feet in length) makes them appear formidable. Heavy infestations may cause stunting in development, a dry harsh coat, and diarrhoea.

Treatment.—Bluestone-arsenic drench as recommended for the large stomach worm is suitable for drenching for this parasite.

An old treatment, which, however, is not as effective as bluestone-arsenic, is:—

White arsenic	..	2 oz.
Epsom salts ..	..	6 lb.
Water ..	..	2½ gallons.

Give 1½ to 3 oz. of this according to the age of the calf. Boil the arsenic slowly in 2 gallons of water for half an hour, pour off the sediment and add the epsom salts.



Conical Fluke
(Natural size.)
a.—Adults from paunch and honeycomb.
b.—Young flukes from small intestine.
[*After Roberts.*

Parasites of the Large Intestine.

THE WHIPWORM (*Trichuris* spp.).

This worm is found in the caecum or blind gut. The head end is long and slender, like a whip lash, and the tail end is stout like a whip handle. They do not do much harm, and treatment is not specially carried out.

THE LARGE BOWEL WORM (*Bosicola radiatum*).

This stout, white worm is about ¾ inch long with one end bent like a pot hook, and is located in the large bowel in the coiled part or "crown." It causes anaemia, loss of condition, diarrhoea, and the dung contains mucous. Death may occur in serious cases in young cattle. The larval form of the worm burrows into the gut wall and may produce nodules in both the small and large intestines.

Treatment.—Phenothiazine, as recommended for the large stomach worm, will control the parasite.

Parasites of the Lungs.

THE LUNGWORM (*Dictyocaulus viviparus*).

This is a white, round worm, up to 3 inches long, which occurs in the trachea and bronchi. The amount of damage done is doubtful. When the calf is already low in condition, due to infestation with other parasites, lung worms, in addition will cause coughing. In severe cases the coughing out of blood-stained frothy mucous, and the onset of peumonia may be induced.

The general control measures used for other parasites should be applied, and in addition the injection recommended for the lung worm in sheep may be used. The injection is made with a hypodermic syringe, the needle being inserted between the rings of the windpipe. The calf is held on its side during the operation. The dose varies with the size of the calf, and for every 100 lb. of the calf's weight is:—

Oil of turpentine	..	..	1.0 c.c.
Oil of creosote	..	..	0.5 c.c.
Chloroform ..	..	..	0.5 c.c.
Olive oil ..	..	..	5.0 c.c.

TAPEWORM CYSTS.

The larval forms of two types of tapeworms, namely, *Echinococcus granulosis* and *Cysticercus tenuicollis*, occur in the lung or liver of cattle. The adults of these live in the dog. They do little harm to the cattle.

Parasite of the Liver.

THE LIVER FLUKE.

This is the same parasite that is found in the liver of sheep. Cattle may be heavily infested and yet show little ill effect. In the case of very severe infestations, young cattle will show anaemia, lack of stamina, bottle jaw, and pot belly. Symptoms are mainly in evidence in the winter. Further details are given in a pamphlet on fluke disease of sheep, which may be obtained on application to the Department.

Treatment.—Carbon tetrachloride is effective, but it is risky to drench adult cattle, particularly those that are milking. Young cattle may be given 2 c.c., older calves (over 12 months) 4 c.c. This drench is put up

commercially for use with sheep, and these doses are equivalent to 5 c.c. and 10 c.c., respectively, of the double strength fluke drench used for sheep. For some weeks before drenching the young cattle should have available to them a lick of bone meal and salt, preferably placed out separately.

The Life Cycles of the Parasites.

Logical control methods must take into consideration the life cycles of the parasites it is hoped to control. With the exceptions mentioned later, the internal parasites of cattle have a somewhat similar life cycle, which is roughly as follows.

The adult worm lays eggs which pass out in the dung. Under suitable conditions of moisture, the egg segments reach an infective stage, are eaten up with the pasture, and reach maturity again in the host animal. Muggy conditions and swampy overstocked pastures favour heavy infestation of the pasture with the infective forms.

In the case of lung worm the eggs are coughed up, swallowed, and reach the infective stage while passing through the intestines.

In the case of liver fluke, a snail of the genus *Limnea* is necessary to act as an intermediate host. In the case of the conical fluke, another snail is necessary to act as an intermediate host. The adult fluke exist in the second stomach of the calf, and are jelly bean in shape.

In the case of tapeworks, the segments pass out in the dung, the infective forms are eaten by tiny mites in the pasture and in these they undergo development. If these infected mites are eaten by the animal with the pasture, the tapeworm reaches maturity in the intestine of the calf. Wet shady pastures favour the presence of these mites.

It will thus be seen that in the case of all the parasites dealt with, wet conditions favour the completion of the life cycle.

Influence of Stocking.

It is also obvious that the use of permanent paddocks for calves, or cattle, favours the completion of the life cycle, whereas frequent shifts, and the rotation of paddocks will allow infective forms to die out before calves come back again to ingest these parasites. Further, it is obvious that the more cattle that are placed on a given area the greater are the chances of reinfestation.

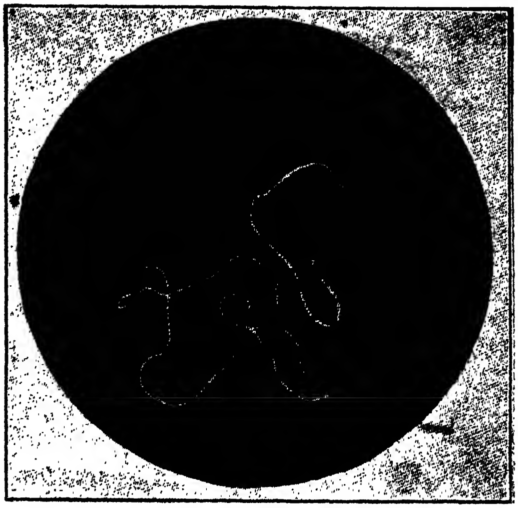
General Control Measures.

The following principles should, therefore, be observed as far as may be possible. As calves and yearlings are most susceptible, they should be given particular consideration:—

1.—Keep stock off damp pastures. If impossible to drain, then reserve for adult cattle only.

2.—Avoid overstocking.

3.—Avoid permanent pastures for young stock, and if possible place them on pastures that have been spelled from cattle or sheep, and which have only carried horses, or have been spelled from all stock. If impossible to spell, burning off may help to minimise worm forms. Generally speaking this is an undesirable proceeding, from the pasture management point of view, but it may be desirable under some circumstances.



Lungworm.
(Reduced in size.)

4.—Above all, maintain the nutrition of the calves. On weaning, supply them with a good supplementary ration and place them out on improved pastures. Upland or hill country, often used to depasture calves (to keep them fine), results in very poor development, and greatly increased susceptibility to worm infestation. A suitable lick, *e.g.*, salt and bone meal placed out separately, should also be supplied.

5.—Supply water in troughs. Stagnant pools with the green pick round them are a common source of heavy infestations.

GRASS TETANY.

A Cattle Disease Often Associated with Flush Growth.

G. L. McCLYMONT, B.V.Sc., Veterinary Officer.

REPORTS from Departmental Officers have indicated an increased number of cases of the disease in cattle known as grass or lactation tetany or grass staggers, heavy losses being sustained in some cases. All cattle owners are advised to be on the alert for the appearance of this disease and to be prepared for its treatment should it occur.

This disease usually makes its appearance during periods when seasonal conditions cause a rapid growth of improved pasture or fodder crops such as oats, but some recent cases have occurred on average natural pasture.

Stock affected are usually well conditioned milking cattle within one to four weeks after calving, though the disease sometimes occurs later. However all types of cattle including calves, steers, dry cows and bulls may be affected at times. Cattle appear to be more prone to develop the disease when first introduced to lush pastures or fodder crops so that, as suggested above, cases are often encountered with the first flush of spring growth.

The cause of the disease is not known but the disease is often correlated with the above type of grazing; it is non-infectious, and its main symptoms result from a comparatively large drop in the magnesium, and often the calcium, content of the blood. Various theories, ranging from magnesium deficiency in the pasture to toxins produced by bacteria in the bowel, have been advanced as to the cause. Frequently the disease in milking cows is confused with milk fever, but it differs from that disease in that milk fever usually occurs within, at the most, four days after calving, whilst grass tetany rarely appears in milking cows until at least a week after calving, and again in that the main symptoms of milk fever are dullness and prostration, whereas the main symptom of grass tetany is extreme nervousness.

Symptoms.

Typical symptoms of the disease are: evidence of increased nervousness and excitability, such as unsteady gait, rolling eye, an anxious or wild appearance, frothing at the mouth, salivation, twitching of muscle groups and often aimless and excited charging about; usually appetite and milk flow decreased; and at any time after entering the state of excitability, the animal may develop an attack of convulsions, particularly if excited or disturbed, often falling to the ground on the side with the legs extended and paddling, jaws clenched, head thrown back, distressed breathing and other evidence of contracted or "tetanic" muscles. These convulsions may end in death, or in a coma which may last for several days before death or complete recovery. In very acute cases the convulsions may commence without any previous symptoms, and often the animal is just found dead.

On post mortem there is nothing in particular to be seen, but if a careful examination is made, small haemorrhages on the outside wall of the heart and reddening of the lining of the small intestine may be noted. If serum samples from affected beasts are taken and analysed, low magnesium and often low calcium, contents are found.

Treatment.

As the main symptoms are probably traceable to the fall in the magnesium content in the blood, the logical treatment is to counteract this fall by providing magnesium. This can be done by drenching or injecting a solution of Epsom salts (magnesium sulphate). Although this treatment is very far from being 100 per cent. effective, subacute cases may respond to it. Drenching with a solution of ½ lb. Epsom salts in 1 pint of water with, if available, 2 to 3 lb. of molasses, whilst effective if the animal has not developed advanced symptoms, is rarely used with advanced cases, as the drench is liable to induce convulsions, causing a possible entry of the drench into the lung with consequent pneumonia.

Injection of the Epsom salts solution is the most effective treatment, 2 oz. of Epsom salts dissolved in 7 fluid oz. (200 c.c.) of water being injected behind the skin of the shoulder, half being injected in each side. For best results the solution should be injected direct into the blood stream, but this operation should only be carried out by a veterinarian.

Stimulant drenches as advised by a veterinarian may also be of use. Calcium bonogluconate 7 fluid oz. (200 c.c.) of 20 per cent. solution, should be injected if the beast fails to respond to the Epsom salts, or it may be injected with the Epsom salts.

In practice, management of the cattle and the pastures so as to avoid sudden changes to lush feed, and to avoid making the cattle wholly dependent on such feed has been found to be followed by good results. Such methods are often not practicable as a routine practice, but in those seasons when grass tetany is prevalent, allowing the cattle on to the lush pasture or crops for only a limited time each day until they have become used to such feed, and giving hay, chaff, silage or starchy concentrates before or whilst on the pasture, will be valuable preventive measures.

There is no evidence that deficiency of magnesium in the feed is directly responsible for the drop in the magnesium content of the blood, but

(*Continued on page* 490.)

FEEDS and FEEDING NOTES.

Contributed by
The Division of Animal Industry.

Protein and Its Importance in Production Programmes.

IN last month's notes a good deal was said about the shortage of protein and "home production" of protein. Further facts on this subject are given this month to facilitate the practical application of these points as regards production programmes.

Proteins can be said to be the basis of all living matter, and are complex combinations of rather simple compounds, all containing nitrogen, known as amino acids. There are about twenty-two known amino acids and some ten of these are called "essential," as they cannot be formed by the animal body itself, but must be provided in the feed. Thus there are two classes of protein—"first class" containing a good mixture of essential amino acids, and "second class" containing a poor mixture of essential amino acids. Protein of animal origin, *i.e.*, protein in meat, eggs, dairy products, etc., belongs to the first-class group, and protein of plant origin to the second-class group. As poultry and pigs rapidly build up large quantities of first-class protein in the form of pig meats and eggs, they require a certain amount of first-class protein in the diet; this is usually supplied by skim milk or meat meals.

Cattle have not been included with the pigs and poultry and, taking into account the large amounts of first-class protein in milk, it is reasonable to query this exception. The explanation, however, is as follows:—Cattle eat large quantities of bulky food such as pasture, hay and silage, none of which contains really first-class protein, and this food, after having been chewed and mixed with the saliva, remains in the paunch or rumen for some hours. During this time, myriads of micro-organisms feed on this forage, attacking and digesting, among other material, the fibre and protein of the fodder, and they multiply enormously in numbers. Eventually the contents of the rumen, including these micro-organisms, pass into the stomach and intestine, where the unattacked portion of the food and the organisms (which have been killed by the digestive juices) are digested. These organisms have the capacity to seize on second-class protein and simple non-protein nitrogenous compounds in the feed of the cow and convert them into relatively first-class protein, so that when they are digested, the cow is supplied with a fair quantity of first-class protein; sufficient, in fact, to provide all the essential amino acids required for the milk.

Thus, in considering this question of proteins in relation to feeding of stock, we must take into account the following facts:—

1. The digestive systems of pigs and poultry are such that these stock cannot obtain all their requirements of protein for maximum growth rates or egg production from bulky feeds, and so must have a certain proportion of protein concentrates in their feed.

2. Pigs and poultry cannot obtain sufficient of the essential amino acids required for maximum production from plant proteins, and so must have some source of animal protein in their diet.

3. Cattle can obtain all their protein requirements from bulky feed, providing it is sufficiently high in protein, and do not require a source of animal protein in their ration.

4. Protein concentrates, especially those containing animal protein such as meat meals, are in short supply.

There is an urgent demand for increased production of poultry, pig and dairy products, so that, taking into consideration the above factors, primary producers should shape their feeding policy along the following lines:—

1. Wherever possible, provide the protein requirements of stock by protein-rich feeds produced on the farm, *i.e.*, improved pastures, young cereal crops, lucerne, clovers, cowpeas, field peas and hays and silages made from these materials. All the protein

requirements of cattle, and a good proportion of the protein requirements of pigs can be met with these feeds. Not only will there be a saving in protein concentrates but increased production, increased economy of production, and saving in transport of feed.

2. The valuable protein supplements containing first-class protein—such as meat meals, skim milk and butter milk—should be used in the smallest amounts necessary to provide a supplement of first-class protein and maintain production at a maximum. To avoid the wastage of first-class protein occasioned by feeding larger amounts than ½ to ¾ gallon of skim milk or butter milk per pig per day, matings should be arranged so that the maximum number of pigs on the farm coincides with the maximum amount of skim milk or butter milk produced. Poultry and pigs should be fed only carefully calculated and weighed amounts of meat meal.

3. Where meat meal must be used, as for poultry and pigs, and meat meals are in short supply and oil meals are available, use mixtures of meat meal and oil meals such as two parts meat meal and one part linseed meal to replace the meat meal, slightly increasing the amount of mixture for poultry to make up for the difference in protein content of meat meal and linseed meal. For pigs, the mixture can replace equal quantities of meat meal.

Points to Remember.

Greatly increased production of bacon, eggs and dairy products is essential for feeding our own and Allied troops, Britain and our civilian population.

One of the main factors which might limit production is shortage of protein-rich feeding stuffs.

It is the obligation of all primary producers to consider how they can produce more protein-rich feed on the farm, and so spare our limited supply of protein concentrates for essential uses.

The Economics of Supplementary Feeding to Increase Dairy Production.

PRIMARY producers have been told of the necessity for increased production of dairy products. Obviously this increase can be obtained in one or more of several ways.

1. By improving the milking capacity of our cattle, *i.e.*, by better breeding.

2. By increasing the numbers of our cattle.

3. By improving the production of our present cattle, *i.e.*, by better feeding.

An immediate increase in production is required—not an increase in several years' time—so that our main hope for increased production lies in better feeding. It has been estimated that if all dairy cattle were fed so that they produced another 4 lb. of milk per head per day, the production goals would be reached. The average milk production per head per day for New South Wales is estimated to be less than 1½ gallons per head, so that there is no doubt that better feeding can go a long way towards producing the amounts of milk required for our production programmes.

Will Feeding Pay?

The only question to which any dairy farmer can justifiably require a satisfactory answer before endeavouring to increase his production by better feeding, is, "Will it pay?" Obviously, there are circumstances where increased feeding will not pay, such as where cattle are being so fed that they are already producing their maximum of milk and where cattle, having been allowed to drop in production by bad feeding have reached such low condition and poor production that increased feeding will not cause them to respond; but in all other circumstances the answer to the question "Will it pay to feed?" is a definite "Yes," if the supplementary feeding is done with due regard to the relative costs of feed, to food values and to the factors which are limiting production.

The factors limiting production of milk can be either protein deficiency or energy deficiency, so that supplementary feeding must be directed towards correcting these.

The overhead or running costs of a dairy farm depend only to a slight extent on the volume of milk production, *i.e.*, on the amount of milk produced per cow, so that if by supplementary feeding with grown or bought fodder, an increase in production is obtained, the difference between the cost of the feed, plus the extra labour entailed

in feeding, and the return for the extra milk obtained, can be taken as practically clear profit.

Feeding to Overcome Protein Deficiency.

Let us consider a case where protein deficiency is limiting production, such as where cattle are being fed liberal amounts of chaffed cow cane or sorghum, both extremely poor sources of protein but relatively rich in starch or energy, so causing the cattle to increase in condition by laying down of fat, but not allowing them to produce any large quantity of milk. Amounts of various feeds necessary to remedy the protein deficiency to the extent that they would provide the protein for another gallon of Jersey milk, are as follows:—

Feed.	Cost per ton.	Amount of feed required to provide protein for 1 gallon of milk.	Cost of feed required to provide protein for 1 gallon of milk.
	£	lb.	d.
Lucerne chaff ...	10	6	6·4
Licerne chaff ...	5	6	3·2
Lucerne chaff ...	2	6	1·3
Linseed meal ...	10	2½	3
Cocoanut meal ...	7	4	3·4
Peanut meal ...	£6 10s.	1½	1
Wheat meal or barley meal ...	8	7	6·7
Bran and pollard ...	6	6	4·3

Thus where protein-rich feeds such as oil meals, or lucerne chaff bought at reasonable prices of below about £5 per ton or produced on the property, can be used to supplement home-grown starchy roughages, the supplementary feeding is economic, *i.e.*, the cost of the feed is well below the average return per gallon. However, if the wrong supplements are used, such as wheat meal, which is not a protein-rich feed, or lucerne chaff bought at high prices, then returns from the supplementary feeding will be small or non-existent.

Feeding to Provide Energy.

Now consider a case where adequate protein is present in the ration, such as where good quality lucerne chaff is available for supplementary feeding, but where the energy side of the ration is deficient due to the fact that not sufficient hay is available. Food to provide the energy requirements for one gallon of milk is shown in the table below.

From these figures, it can be seen that where the starch or energy content of a ration is limiting production, and concentrates can be bought at reasonable prices, or roughages such as maize or chaff can be conserved on the farm, or bought cheaply, supplementary feeding can be economic. Where, however, roughage is bought at high prices the difference between the cost of the feed and the return for the milk is very small, and the feeding is probably not economic.

Feed.	Cost per ton.	Amount of feed required to provide energy for 1 gallon of milk.	Cost of feed required to provide energy for 1 gallon of milk.
	£	lb.	d.
Wheat meal ...	8	4½	4
Crushed oats ...	9	5	5·4
Bran	6	5½	4
Pollard	6	4½	3½
Wheaten, oaten or lucerne chaff ...	8	7½	6½
	4	7½	3½
	2	7½	1½
Maize silage ...	1	25	3

Similarly, it can be shown that where the ration is insufficient in both protein and energy, supplementary feeding by purchased or home-grown concentrates, or home-grown roughages or roughages bought at reasonable prices, will give dividends. For example, a mixture of three parts wheat meal and two parts linseed meal fed at the rate of 4 lb. per gallons is an economic proposition.

From inspecting of both sets of figures given above, it can be seen that the ideal as regards economic supplementary feeding is—

1. To grow enough protein-rich and starchy-rich fodders to provide all the nutriment for supplementary feeding.

Or where this is impossible—

2. To conserve and use as much roughage as possible, and use the cheapest available concentrates, either protein-rich or starchy, as is required, to bring the food level up to requirements.

The most important point is that if a dairy farmer has to purchase roughages, such as oaten chaff and lucerne hay, at the high prices at which they are commonly available, then he must abandon all hope of obtaining any degree of profit from his supplementary feeding. *So grow and conserve as much roughage as possible and buy concentrates if necessary to supplement this feed.*

Current Feeding Costs.

Feed.	Starch Unit Value per 100 lb.	Protein Unit Value per 100 lb.	Cost.	Cost per Starch Unit.	Cost per Protein Unit.	Remarks.
ROUGHAGES.						
Lucerne hay or chaff (good, sound).	35-45 (av. quality 40).	10	£7 10s.-£10 long ton ...	2d.-2·7d.	...	Roughages continue to be dearer, as sources of food matter, than concentrates.
Oaten chaff (good, sound).	40	3	£8 10s. long ton ...	2·3d.	...	
Wheaten chaff ...	40	3	£8 10s. long ton ...	2·3d.	...	
Oaten hay	33	3	£6 long ton	1.9d.	...	
Wheaten hay	33	3			...	
STARCHY CONCENTRATES.						
Wheat	72	8	3s. 6½d. per bushel in truck lots—bagged (Sydney basis).	1d.	...	Wheat and barley the cheapest sources of food matter, pollard and bran the next cheapest, followed by oats, with maize the dearest source of food matter. Barley meal supplies limited.
Wheatmeal	72	8	£7 5s. short ton ...	1·2d.	...	
Maize	78	8	7s. bushel	1·9d.	...	
Maize meal	78	8	£14 short ton	2·2d.	...	
Barley	71	7	3s. bushel	1d.	...	
Barley meal	71	7	£7 10s. short ton ...	1·3d.	...	
Oats	62	8	3s. bushel	1·5d.	...	
Crushed oats	62	8	3s. 8d. per 40 lb. ...	1·8d.	...	
Pollard	66	10	£6 short ton	1·1d.	...	
Bran	56	10	£6 short ton	1·3d.	...	
PROTEIN CONCENTRATES.						
Linseed meal	72	25	£9 10s.-£10 10s. short ton.	1·6d.-1·7d.	4·5d.-5d.	Stocks moderate.
Peanut meal	78	43	£6 10s. short ton ...	1·1d.	1·8d.	Stocks limited.
Cocoanut meal ...	76	15	£7 short ton, f.o.r. ...	1·1d.	5·1d.	Stocks limited.
Meat meal (55-60% crude protein grade).	80	55	£10 10s. short ton ...	1·6d.	2·3d.	Stocks limited.
Meat meal (45 % crude protein grade).	60	40	£10 short ton	2d.	3d.	Stocks limited.
Blood meal	63	68	£14 short ton	2·7d.	2·5d.	Stocks limited.

MINERAL SUPPLEMENTS.

Mineral.	*Cost.*	*Supplies.*
Ground calcium carbonate (limestone)—a calcium supplement.	34s. per ton in bags, (truck lots).	Supplies available.
Bone meal (a calcium and phosphorus supplement)...	£14 10s. per ton, F.O.R.	Supplies moderate.
Bone flour (a calcium and phosphorus supplement)...	£11 15s. per ton, F.O.R.	Supplies available.
Shell grit (a calcium supplement)	30s. per ton (bulk) ...	Supplies available.

Oats for Pigs.

THERE is a possibility that, in the near future, increased supplies of oats may be available, so that all pig farmers should be in the position of being able, if necessary, to use oats as part of their pig ration.

On account of their relatively high fibre content (10 per cent. as against about 2 per cent. in wheat), oats are not satisfactory as the only grain for pigs. Indications from overseas observations are that up to one-third of the grain ration may be replaced by oats without materially affecting growth rates or amount of feed required per pound live weight increase, and that where up to half of the grain ration of growing stock is made up with oats, decrease in growth rates and increase in amount of feed per pound live weight gain is probable.

The oat grain should always be well crushed, and it should be noted that soaking or boiling is no substitute for breaking up the grain in this manner. In fact, soaking or boiling may even decrease digestibility of the whole grain.

Where wheat is 4s. a bushel, oats is as good buying if not more than about 2s. 3d. per bushel, and with wheat at 3s. per bushel, oats is as good buying if not more than about 1s. 8d. per bushel.

As sows and boars are not actively growing, they can handle a bulkier ration than

can growing stock, and so up to 50 per cent. or more of oats may be included in the feed of these animals.

As with wheat, mixtures of oats and other grains must, for maximum growth rates, be supplemented with meat meal (¼ lb. per day being sufficient), minerals (such as 1 per cent. of ground limestone and 1 per cent. salt), and at least 1 to 2 lb. of green feed per day as a vitamin supplement. Rations should be based on a rough figure of about 1 lb. of dry food per month of age, so that a three months' old pig could receive 1¾ lb. wheat, 1 lb. oats and ¼ lb. of meat meal per day, plus green feed and minerals.

Supplementary Feeding Neglected in Tableland Areas.

In his report for the month of July, the District Veterinary Officer, Armidale, commented on the severity of the winter in the Northern Tablelands and other parts of the north. Sheep generally fell back seriously in condition and losses due to malnutrition occurred. In far too few cases was supplementary feeding of sheep carried out, and once again many stockowners abstained from commencing such feeding until it was too late.

At a time when production of meat of all types is a matter of national urgency, there is more than ever need to guard against losses due to inadequate nutrition.

It is realised that the manpower situation has been one of considerable difficulty, but exactly the same type of report was often furnished by departmental officers in years prior to the war, and therefore it would appear that the unsatisfactory position regarding supplementary feeding is not a product of war difficulties.

In order to stabilise the livestock industries, the problem of supplementary feeding must be faced. Every winter is practically a drought so far as livestock are concerned in the Tableland districts, yet these districts will produce good crops for storing as feed for stock, while good results could also be brought about by proper attention to the pastures through top-dressing, the introduction of improved grasses, and subdivision enabling rotational grazing to be undertaken. Quite apart from the fact that the benefits of these have been shown by a certain number of stockowners themselves, the experimental work carried out at Shannon Vale by this Department has demonstrated the benefits of it conclusively.

During the immediate future years there will be increased demands for meat of all types, and only through the wide adoption of methods of supplementary feeding can this increased supply be assured.

The District Veterinary Officer, in commenting on the position, added that, as would be expected, worm infestation was very prevalent in the areas in which the sheep had been subjected to malnutrition. This has also been a common finding for many years, and the provision of supplementary feeding is one of the best measures which can be adopted to prevent serious effects from worm infestation.—MAX HENRY, Chief, Division of Animal Industry.

Dipping is Not Detrimental to Beef Cattle.

Experience with Departmental Animals.

THE frequently expressed opinion of departmental officers that the dipping of beef cattle during a tick eradication campaign is not accompanied by any ill effects, has been well substantiated by the experience of the Department with its own cattle. About forty head of mixed Aberdeen Angus cattle are kept at Grafton Experiment Farm. These cattle have recently completed thirty-eight dippings at fortnightly intervals. They were inspected the other day by departmental officers, and with the exception of one cow, on which the hair was growing irregularly, the stock were in excellent condition and the skins and coat were particularly good.

These cattle have been running generally on natural pasture with a certain amount of grazing on improved pasture and have had access to a stack of meadow hay. Any stockowner who is interested can see these cattle, and it is felt sure that he would be impressed by their general appearance and bloom.—MAX HENRY, Chief, Division of Animal Industry.

Mortality in Pigs from Rat-soiled Feed.

RECENTLY a mortality occurred amongst pigs in the Tamworth district, in which forty-six died in a herd of about 200. The pigs were for the most part run in open-range conditions, and had access to green cereal crops, oats, wheat and barley. In addition, with the exception of the breeding pigs, a ration of cracked wheat was fed. Deaths only occurred in the pigs getting the grain ration, which on examination was found to be grossly soiled with the excreta from rats and mice. Deaths ceased when the grain ration was discontinued.

Such a mortality is quite likely to occur under the conditions indicated, and care is always necessary to ensure as far as possible that grain fed to pigs is not contaminated by the droppings of rats and mice.—MAX HENRY, Chief, Division of Animal Industry.

Superphosphate Rations for Growers of Non-priority Crops.

THE Minister for Agriculture (Captain W. F. Dunn, M.L.A.), has announced that for the 1943-44 rationing period, superphosphate will be available to growers of non-priority crops including cereals and pastures, other than irrigated or dairy pastures, on a quota basis as previously. Supplies are severely restricted, the total quantity available for these purposes being less than was the case last year.

To preserve the interests of small users, arrangements have been made whereby those whose rations for 1942-43 were 3 tons or less will not be further reduced. Those whose quotas were 3 tons to 5½ tons during 1942-43 will be reduced to 3 tons, whilst those whose quotas were more than 5½ tons but less than 11 tons will be entitled to 55 per cent. of last year's quota. Consumers with 1942-43 quotas of 11 tons or more will be required to submit special applications to the Fertiliser Rationing Officer, Department of Agriculture, Box 36A, G.P.O., Sydney. It will be necessary for such users to show that the fertiliser allocated will be utilised in the production of essential fodstuffs before a permit to purchase will be issued. All orders should be lodged through agents or with manufacturers in the usual way.

The same rationing principljes will be observed irrespective of the source from which supplies are obtained. In the case of those who deal with Victorian firms and whose quotas exceed 3 tons, arrangements have been made to eliminate the anomalies which existed last year.

Special Irrigation Ration.

Irrigationists will be entitled to a superphosphate ration of 1 bag to each 3 acres of irrigated pastures and/or lucerne, in addition to any quota to which they may be entitled for fodder crops, wheat, etc. Applications for this ration must be submitted on a special form and must include a certificate from an officer of the Water Conservation and Irrigation Commission or of the Department of Agriculture that the land has been effectively graded and check-banked.

Rations for Dairying.

Dairy farmers may obtain 1 cwt. superphosphate per acre for pastures and fodder crops. Those in inland districts will be required to present a certificate from a member of a War Agricultural Committee indicating that the quantity applied for is reasonable, having regard to district conditions and the number of cows maintained.

Vegetables and Potatoes.

For these crops the existing rations and arrangements regarding distribution will be continued.

Inadequate Feeding—a Cause of Unprofitable Dairying.

THE ability to breed cattle for high production is of little value unless the feeding is of high standard. Dairy cattle must be fed so that they will have a chance of living up to their inheritance. The dairy farmer must remember that the cow can produce milk only from the food she eats. The greater the quantity, and the higher the quality, the more feed she will require.

The dairy cow is the heaviest worked of all our animals, and a cow giving 600 gallons of 4 per cent. milk in a lactation period, supplies about 780 lb. solids, and these all come from her body. When it is considered that a fattening bullock will take three to four years to produce similar weight of solids in the form of meat, the enormous task of the dairy cow can be realised; in addition, of course, a certain proportion of the feed is required for maintenance of the body. To put it more clearly, perhaps, the system has to be maintained in perfect health so that the animal can perform her appointed work—the production of milk.

Inadequate feeding of dairy cows is one of the chief causes of unprofitable dairying. To increase the production per cow there is some increase in feed, labour and other costs. But the cost per lb. of butter-fat decreases, because the cost items do not increase in proportion to the increased yield of the cow.—G. McGILLIVRAY, Chief, Division of Dairying.

Grass Tetany.

(Continued from page 484.)

there is some indication that increasing the magnesium intake by adding dolomite (a mineral containing 24 per cent. calcium and 10 per cent. magnesium) to silage at the rate of 5 lb. per ton when ensiling, and feeding this silage during the period of lush growth, or giving a lick of equal parts dolomite and common salt, may help decrease the number of cases.

The addition of Epsom salts to the drinking water when watering by trough has been advised. 1 oz. of Epsom salts being added to the trough for every 5 gallons of water and 1 oz. of the salts being added to the trough per day for every cow watering at it. Topdressing with dolomite has also been suggested, but as there is no good evidence that the disease is related to a deficiency of magnesium in the soil or in the plant, it is not considered that this practice is warranted as a means of prevention of grass tetany.

Owing to the necessity for accurate diagnosis and the frequent difficulty of treatment of this disease, stockowners suspecting grass tetany should immediately contact their Stock Inspector or District Veterinary Officer.

DON'T DELAY RAILWAY TRUCKS

THE imperative need for the quick release of goods trucks and wagons, stressed in this column in recent issues of the *Agricultural Gazette*, is again emphasised by the Commissioner for Railways, Mr. T. J. Hartigan.

The Department of Railways has been planning and working with that object in view ever since war needs made such insistent calls on its rolling stock for the movement of Defence equipment, whilst there was little, if any, lessening of transport demands for civilian needs.

Customers of the Railways can help the Department, in this pressing urgency, to overcome the shortage of carrying capacity by seeing that no delay whatsoever occurs to any trucks allotted to them for the loading of goods, or placed for the delivery of their incoming consignments.

Station officials are being constantly urged to speed up the "turn-round" of freight vehicles. They will be glad of the full co-operation of the public in doing so.

EVERY IDLE TRUCK MEANS SOME SLOWING-UP OF THE WAR EFFORT.

S. R. NICHOLAS,
Secretary for Railways.

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
		1943.
Wollongbar Experiment Farm...	112	4 Oct.
Navua Ltd., Grose Wold, via Richmond (Jerseys)	118	4 „
A. E. Liggins, "St. Leger Dairy," Kuring-gai Chase Road, Turramurra North	52	7 „
Australian Missionary College, Cooranbong ...	113	8 „
A. L. Logue, "Thornbro," Muswellbrook ...	46	13 „
Woomargama Estate	207	22 „
A. Hannaford, Braidwood	20	26 „
W. S. Grant, Braidwood	20	26 „
The William Thompson Masonic School, Baulkham Hills	50	29 „
Department of Education, Gosford Farm Home	40	29 „
Berry Training Farm, Berry	162	31 „
W. J. Stephenson, "Hill View," Fig Tree ...	57	1 Nov.
Barnardo Farm School, Mowbray Park ...	75	4 „
State Penitentiary, Long Bay	10	9 Dec.
		1944.
Limond Bros., Morisset	60	13 Jan.
J. M. Turnbull, "Pastime," Kayuga Road, Muswellbrook	75	15 „
E. R. Fishlock, Fig Tree, Wollongong ...	38	18 „
Penney, C. A., "Bringa," Dapto	198	25 „
St. Ignatius College, Riverview	25	27 „
Department of Education, Yanco Agricultural High School	69	6 Feb.
Riverina Welfare Farm, Yanco	74	6 „
St. John's College, Armidale	30	8 „
A. C. O'Dea, Perry Street, Dundas	28	14 „
McGarvie Smith Animal Health Farm, Liverpool	55	22 „
C. Wilton, Bligh Street, Muswellbrook ...	75	3 Mar.
N. L. Forster, Abington, Armidale (Aberdeen Angus)	188	12 „
Forster and Sons, Abington, Armidale (Jerseys)	87	13 „
Lunacy Department, Morisset Mental Hospital	84	15 „
Wagga Experiment Farm (Jerseys)	81	20 „
Trangie Experiment Farm, Trangie	121	20 „
New England University College, Armidale ...	12	31 „
St. Michael's Orphanage, Baulkham Hills ...	18	31 „
W. H. Long, Brodie's Plains, Inverell ...	44	13 April.
A. G. Wilson, "Blytheswood," Exeter ...	62	14 „
H. F. Bradley, "Nardoo," Ashford Road, Inverell	35	15 „
Grafton Experiment Farm	191	15 April.
Lunacy Department, Callan Park Mental Hospital	26	1 May.
T. J. Wilks, "Oaks Farm," Muswellbrook ...	37	5 June.
E. J. Cottell "Kapunda," Rob Roy, Inverell	50	23 „
L. W. Campbell, "Dunmallard," Fern Hill Road, Inverell	32	23 „
E. D. Rankins, "Oakwood," Inverell ...	23	23 „
J. O. McGufficke, "Lovely Bank," Rob Roy, Inverell	20	23 June.
J. H. Lott, "Bellevue," Rob Roy, Inverell ...	23	23 „
Cowra Experiment Farm	66	24 „
New England Experiment Farm, Glen Innes (Jerseys)	73	27 „
G. T. Reid, "Narrengullen," Yass	274	3 July.
Farm Home for Boys, Mittagong	49	9 „
Lunacy Department, Rydalmere Mental Hospital	50	19 „
St. Vincent's Boys' Home Westmead ...	26	20 „
Lidcombe State Hospital and Home	106	30 „
Hurlstone Agricultural High School, Glenfield	37	31 „
Ehsman Bros., Inverell	28	13 Aug
E. L. Killen, "Pine Park," Mumbil	252	24 „
Peel River Land and Mineral Co., Tamworth (Beef Shorthorns)	82	28 „
Fairbridge Farm School, Molong	92	31 „
Bathurst Experiment Farm	24	9 Oct.
Lunacy Department, Gladesville Mental Hospital	34	23 Nov.
Hawkesbury Agricultural College, Richmond (Jerseys)	110	18 Dec.
		1945.
The Sydney Church of England Grammar School, Moss Vale	51	5 Feb.
Koyong School, Moss Vale	2	8 „
New England Girls' Grammar School, Armidale	30	11 „
W. W. Martin, "Narooma," Urana Road, Wagga	143	22 „
R. C. Dixon, Elwatan, Castle Hill (Jerseys) ...	31	29 Mar.
Lunacy Department, Parramatta Mental Hospital	66	30 „
A. E. Stace, Taylor Street, Armidale	38	1 April.
A. D. Frater, King's Plain Road, Inverell ...	123	12 „
F. C. Harcombe, Hillcrest Farm, Warialda Road, Inverell	38	13 „
Parker Bros., Hampton Court Dairy, Inverell	180	17 „
H. F. White, Bald Blair, Guyra (Aberdeen Angus)	186	30 „
Emu Plains Prison Farm	108	7 May.
Sir F. H. Stewart, Dundas	12	5 June.
Kahlua Pastoral Co., "Kahlua," Coolac ...	205	21 „
S. E. E. Cohen, Auburn Vale Road, Inverell...	33	22 „
B. N. Coote, Auburn Vale Road, Inverell ...	79	22 „
A. N. De Fraine, Reservoir Hill, Inverell ...	28	22 „
J. McKenzie, Inverell	19	17 Aug.
W. J. Friselle, Rosenstein Dairy, Inverell ...	93	17 „
W. Budden, "Hunter View," Kayuga Road, Muswellbrook	17	24 „
Farrer Memorial Agricultural High School, Nemingha	36	30 „

Tubercle-free Areas.

The following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis :—

Bombala Area.
Inverell Area.
Braidwood Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

MAX HENRY, Chief of Division of Animal Industry.

Spirochaetosis (Tick Fever) in Poultry.

(*Continued from page* 475.)

most thorough search fails to reveal any ticks. If these materials are difficult to obtain, boiling water is effective, but, of course, very difficult to apply in the boiling state; the blowlamp is particularly useful in iron buildings.

Further information on this disease may be obtained by applying to the Under Secretary and Director, Department of Agriculture, Box 36A, G.P.O., Sydney, for the free Departmental pamphlet "Fowl Tick Fever and Its Carriers."

Abortion-free Herds.

THE following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion-free :—

Owner and Address.	Number in herd.	Owner and Address.	Number in herd.
A.G.H. (No. 14)	70	Killen, E. L., " Pine Park," Mumbil	223
Bathurst Experiment Farm (Ayrshires)	24	Leitch, J. F., " Tunbridge," Merriwa (Aberdeen-Angus)	72
Bauerle, P. A., Holbrook	12	McEachern, H., Tarcutta (Red Poll)	52
Bush, W., Ben Lomond	30	Martin Bros., " Narooma," Urana-road, Wagga	145
Callan Park Mental Hospital	41	Morisset Mental Hospital	81
Carrick G., " Clonlea," Central Tilba	37	Navua Ltd., Grose Wold, via Richmond (Jerseys)	122
Cowley, L., Redbourneberry, Singleton	56	New England Experiment Farm, Glen Innes (Jerseys)	97
Cowra Experiment Farm (Ayrshires)	71	New England University College, Armidale	5
Department of Education—Farm Home for Boys, Gosford	36	Peel River Land and Mineral Co., Tamworth	82
Department of Education—Farm Home for Boys, Mittagong	36	Reid, G. T., " Narrangullen," Yass	171
Dixson, R. C., " Elwatan," Castle Hill	24	Robertson, D. H., Scone	82
Fairbridge Farm School, Molong	93	Rydalmere Mental Hospital, Rydalmere	57
Farrer Memorial Agricultural High School, Nemingha	35	Salway, A. E., Cobargo	95
Forster and Sons, Abington, Armidale (Jerseys)	265	Skinner, D. S., " Wyworrie," Ben Lomond	38
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	188	Smith, Jas. C., Ben Lomond	83
Gladesville Mental Hospital	34	Stewart, Sir Frederick, " St. Cloud Stud " Spurway-street, Dundas	9
Grafton Experiment Farm (Aberdeen-Angus)	29	Trangie Experiment Farm, Trangie	121
Grafton Experiment Farm (Australian Illawarra Shorthorns)	93	Wagga Experiment Farm, Wagga, N.S.W.	45
Hann, O., Chatsworth Road, St. Marys	35	Walker, Jas. R., " Strathdoon," Wolseley Park	32
Hawkesbury Agricultural College, Richmond (Jerseys)	108	White, F. J., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	189
Hicks, A. A., Estate, Culcairn	52	Williams, Chas., Ben Lomond	27
Hill, E. Pritchard, Bowling Alley Pt. (Jerseys)	96	Wilson, A. G., " Blytheswood," Exeter	62
Hordern, E. D., Cabramatta (A.I.S.)	95	Young, A. H., " Rock Lynn," Cudal (Polled Beef Shorthorns)	12
Hurlstone Agricultural High School, Glenfield	39		

MAX HENRY, Chief of Division of Animal Industry.

Brucellosis-free Herd Scheme (Swine).

LIST OF ACCREDITED HERDS.

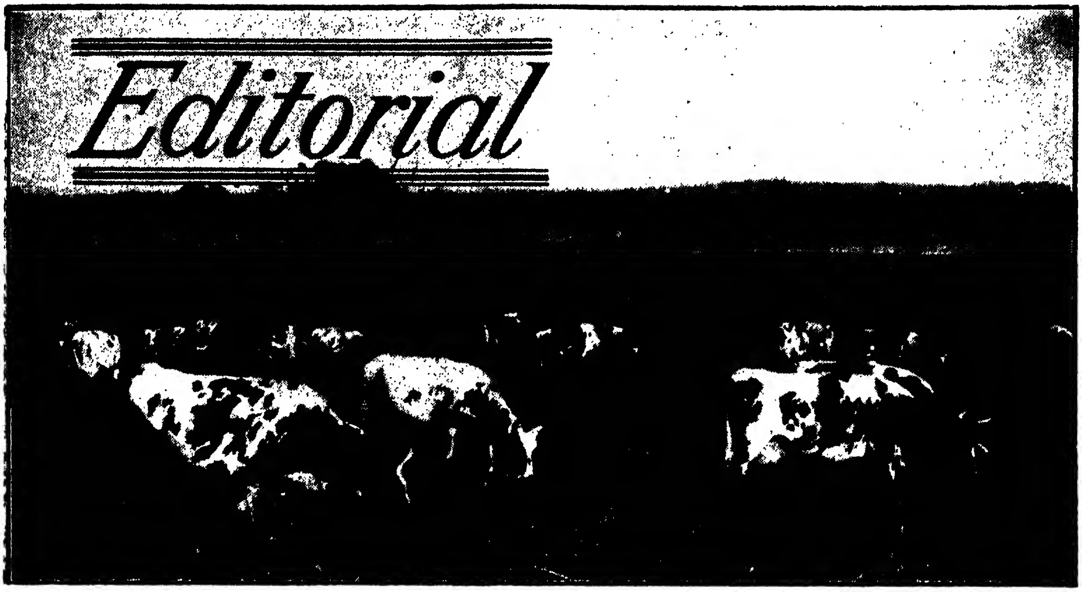
THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Adams, J. P., " Melton," Daysdale.
Bathurst Experiment Farm, Bathurst
Boardman, C., Camden.
Campbell, D., Hillangrove, " Wamberal," via Gosford.
Chapman, G. E. and Son, " Illabo Park," Alectown.
Cocks, F. D., " Condalarra," Gooloogong.
Cowra Experiment Farm, Cowra.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., " Glengar," Capertee.
Farrer Memorial Agricultural High School, Nemingha.
Fisher, J. R., Furlong's Stud Farm, Richmond-road, Blacktown.
Foley, Mrs. E., Bligh Stud Piggery, Water Lane, Rouse Hill.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Holland, A. L., Argonne, Tubbul.
Hurlstone Agricultural High School, Glenfield.
Maybin, N. C., Towac, Orange.
McBride, J. L., " Belvedere," Camden.
McCaughey Memorial Agricultural High School, Yanco.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Government Agricultural Training Farm, Scheyville.
Shirley, G. F., " Camelot," Penrith.
Smith, J. M., Eulo Glen, Urana.
Stewart, Sir Frederick, " St. Cloud," Dundas.
Wagga Experiment Farm, Wagga.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., " Gwandalan," Grenfel.
Wilson, A. G., Blytheswood, Exeter.
Wollongbar Experiment Farm, Wollongbar.

Herds Other than Registered Stud Herds.

Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Croft, H. M., " Salisbury Court," Uralla.
Glen Innes Prison Camp, Glen Innes.
Gosford Farm Home for Boys, Gosford.
Goulburn Reformatory, Goulburn.
Kenmore Mental Hospital, Kenmore, via Goulburn.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital, Orange.
Parramatta Gaol, Parramatta.
Peat and Milson Islands Mental Hospital, Hawkesbury River.
Pollak, V., Marata, Harrow Road, Glenfield.
Smith, C. W. J., " Norbiton," Canadian Lead.
Stockton Mental Hospital Stockton.
Yanco Agricultural High School.



The Agricultural Gazette.
NOVEMBER, 1943.

Dairy Production.

AUSTRALIA'S dairy production target (in terms of milk) for 1943-44 is 1,210 million gallons. Previous good seasons have lifted production to within an ace of that figure. As the present season, in New South Wales at any rate, promises well, it looks as if nature will make easily possible, what earlier appeared to be most difficult of achievement.

The target for 1943-44, however, is to be regarded, not as the maximum, but rather as the minimum. Actually "The sky's the limit" in dairy production, though the target is something substantial to aim at, and, wisely, has been placed well within sighting range in case the conditions should prove difficult.

Figures running into millions, let alone thousands of millions, are often bewildering and meaningless. Let us, however, reduce the dairy production target to the simplest terms. It means that if production per cow is increased (above normal) by about ¼ gallon per day the objective (1,210 million gallons) will be achieved. Looked at in this way the nation's dairy production target becomes an individual or farm target—well within the capacity of both the Australian dairy cow and farmer.

It has been estimated that the extra feed expected as a result of the promised favourable season will ensure half of the desired increase, leaving the other half to the effort of the dairy farmer. But not to the dairy farmer alone.

Thousands of key men are to be returned to this industry. Liberal finance has been made available by the New South Wales Government to enable dairy co-operatives and farmer co-operatives to purchase tractors and cultivating implements for the greater mechanisation of the dairy farming industry. Furthermore, funds are being made available by the New South Wales Fodder Conservation Committee to assist farmers to store and to grow more feed, as well as to improve their pastures. More adequate feeding is undoubtedly the key to increased and more stable production.

There is perhaps no better organised industry on the manufacturing side than the dairy industry. Full advantage should be taken of various forms of assistance now being made available to place the production side of the industry on the same high plane as the manufacturing side. In this connection the field officers of the Department of Agriculture, working in collaboration with the War Agricultural Committees and with the dairy farmers' own organisations, are out to render every assistance.

Preliminary Wheat Harvest Forecast.

THE first or preliminary forecast of the wheat harvest in this State during the current season has been issued by the Division of Marketing and Economics of the Department of Agriculture. Based upon crop conditions and prospects existent at 7th October, 1943, the estimated yield is shown as 39,000,000 bushels.

Production in New South Wales during the season 1942-43, as officially recorded by the Bureau of Statistics, was 51,693,000 bushels from 3,033,000 acres, but this year the total area sown to wheat, according to figures obtained from the same source, is smaller.

Throughout the greater part of the growing period, the rainfall, although fairly frequent in most districts, was of a relatively light nature and in most cases there has not been any great reserve of subsoil moisture.

Precipitation during September varied considerably. Over a fairly large section of the wheat-growing areas above average falls were received, mostly in many light showers, and the weather generally favoured growth. In such districts generally good yields are anticipated. In other districts, however, registrations were under average and at this stage it would appear that yields will be moderate to light only.

Rationing of Silo Space for the Coming Wheat Crop.

THE Minister for Agriculture and Forests (Hon. W. F. Dunn, M.L.A.) states that in areas wherein it is proposed to control transport so that rationing of silo space becomes desirable, the following procedure should be arranged, allowing, of course, for variations that may be necessary through local conditions.

When rationing of silo space is arranged, it should be accompanied by zoning of deliveries to each silo. A list showing the suppliers to each silo with their estimated total quantities for delivery to that silo should be prepared by the War Agricultural Committee. This information would be supplied to the silo agent, who would then know when any grower had delivered the required percentage or quantity.

It is considered advisable that the first quota for each grower should be on the basis of, say, 60 per cent. of his total quantity of f.a.q. wheat, no grower to deliver a quantity in excess of 800 bags, the position in this regard to be reviewed continuously by the local committee as crop and harvesting conditions require.

The Minister pointed out that the position of country silo space to-day cannot be regarded as the position that is likely to exist throughout harvest time, as it is the intention to continue the outloading of No. 6 Pool wheat as quickly as orders and the railway truck supply will permit. It is therefore probable that space will continue to be made available during the period of wheat receival.

Precautions Against Bush Fires.

As summer approaches it is the job of every citizen to guard against damage from bush fires. The landholder should take special precautions to ensure that the use of fire on his property does not endanger his or his neighbour's possessions, which are the assets of the nation. The tiniest spark can start a holocaust.

The importance of observing the following rules is stressed:—

1. See that your producer gas unit is properly constructed and functioning properly. Do not leave any burning material by the roadside.
2. Safeguard your property with firebreaks and co-operate with the local council in any general scheme for planning a break system.
3. Do not light fires in windy weather.
4. Clear a space round your camp fire and see that it is out before you leave. Soak it well with water, and if water is unavailable, cover it well with earth.
5. See that your match or smoking material is out before discarding it.

Finally, join in the annual campaign of the Bush Fires Advisory Committee which is doing such splendid work in conjunction with local councils in improving our fire defences.

Giant Panic Grass Seed Retains its Viability.

THE viability of the seeds of many of our dry weather resistant grasses improves with five to six years' storage, and experience during recent years at Trangie Experiment Farm with Giant Panic (*Panicum antidotale*) seed has shown that this species may be included in the group.

Good rain in the summer of 1939 at Trangie encouraged vigorous pasture growth, and heavy yields of Giant Panic seed were obtained in the following May. First grade seed was tested in July of that year and gave an average germination of 67 per cent.

The residue seed was stored in hessian bags on the cement floor of a galvanised iron barn, and when tested in September last, gave the satisfactory germination figure of 74 per cent., indicating that, during the four years of storage under Trangie climatic conditions, the viability of the seed had not been reduced.—J. N. WHITTET, H.D.A., Chief Agrostologist.

Some Ideas On . . . . .

RURAL RECONSTRUCTION.*

A Vigorous Permanent Agriculture is Vital to National Stability.

MAX HENRY, B.V.Sc., M.R.C.V.S., Chief, Division of Animal Industry.

"THERE can be no vigour in the nation if there is no vitality in the land." In this arresting phrase, Professor Kay, of Reading, although speaking of England, has set out with startling clearness the position of Australia. No plan for post-war reconstruction, or a new order, or any satisfactory future for Australia can be successful if the truth of this statement is forgotten.

Denmark, one of the first countries to establish a planned society, owes her striking development to her appreciation of this fact. Howe, writing in 1934 on what he describes as the most complete agricultural recovery in history, says: "In the 'eighties of last century, Denmark was confronted with a farm collapse as complete as that of the United States. To many it appeared an irremediable collapse. The nation was in despair. One finds the word 'despair' running through the literature of that period. The growing of grain had been the main agricultural industry, but the opening of the American west had all but destroyed the Danish grain trade. A German tariff wall had been erected against Danish livestock . . . In less than two decades the Danish people changed all this. They did it without aid from the outside world. The country literally rose from the ashes. To-day, Denmark is the outstanding exhibit of what a country can be made by wise statesmanship on the one hand and by an aggressive assertion of scientific principles and human rights on the other." The means whereby she secured this maintenance of vitality in the land will be indicated later.

Subconsciously England has never quite lost sight of this truth, though the lamp has burned dimly at times; but, at the present moment, the exigencies of war have brought the problem into the limelight. Jacks, writing in 1942, describes the persistence of the idea as follows: "There is nothing particularly difficult about the technique of permanent agriculture, but the conditions which make its application generally acceptable must obtain. In Britain, they have obtained for so long that soil conservation has become the primary concern of agriculture, and not all the outcry for super-efficient farming can shift the deeply-rooted instinct of the community to preserve the soil intact."

Land Exploitation in Australia.

In the newer countries of the world, such as Canada and Australia, the necessity for preserving this vitality has been almost completely immersed in the exploitation of the land to supply overseas markets, without which a sparsely-populated country could not have found the wherewithal to continue development. It is necessary, in the interests of Australia, to press home to her people the fact that without a flourishing rural society, no sustained progress is possible.

Unfortunately, the concentration of such a large proportion of the population in a few big cities has created a society which is, to an astonishing extent pitifully ignorant of the place which the land occupies in all civilizations. This increasing section of the Australian people is becoming so divorced from any realization that all industry derives in the first place from the land, or sea, and wields such political power in all directions that there is grave danger lest a seriously unbalanced state of society should develop.

The Four Primary Industries.

The primary industries are agriculture (in a broad sense), mining, forestry and fisheries, and the greatest of these is agriculture. There is no secondary industry in this or any other country, which is not completely dependent on those four for its very existence. Secondary industry is simply the translation of a raw product into the manufactured article. There are not a few industries which are unnecessarily turning a raw product into a highly sophisticated end-product. This applies particularly to food.

The only one of the four primary industries which shows any decline in necessity is mining. Articles, previously made from metal, are now manufactured from agricultural products. The use of coal and oil can be, to a large extent, superseded by water power and electricity, and this source of power has such advantages that, in a well-planned State, its utilization must inevitably increase. It is becoming doubtful whether gold is of any real importance in modern life.

This very fact of the decline of the intrinsic importance of mining, in itself increases the importance of the other three primary industries, but mining still remains, and will, in many ways, continue to exist as an essential provider of supplies for secondary industry. For war purposes, it cannot be replaced until science devises new methods of destroying life. Mining is, from its very nature, an exploiting industry. It can never become a conserving industry.

The conserving element in fisheries is not apparent at present here, and it is not easy to see how it could be developed except as an adjunct to agriculture and human health through the supply of certain commodities, though further research may alter the picture.

* Reprinted from *The Australian Veterinary Journal.*

Importance of Forest Conservation.

Of the four primary industries, two remain as conservators: agriculture and forestry. The Australian attitude towards forestry has been, and still is, to an alarming extent, one of destruction and exploitation. The urbanized mind of the cities cannot grasp the role of forestry in conserving our national life, and the rural mind too often seeks the immediate gain without looking forward to the ultimate loss engendered by the uncontrolled destruction of timber.

Therefore, on no side was there, in this country, a strong influence directed in the proper way towards this conserving industry. Only by the adoption of a long-range policy can our forests be saved and properly used—a policy looking ahead for generations, dictated by community interest and therefore only to be anticipated from enlightened governmental control.

The war situation is regrettably accelerating the destructive process, and this magnifies the urgent need in post-war reconstruction for governmental control and increased activity in regeneration beyond anything yet experienced or foreshadowed. Such control and activity must be exercised on a scientific basis and without any consideration except that of national well-being. Apart from its own merits, properly directed forest control is the handmaid of agriculture, through its influence on water control and dispersal, on soil creation and control and on wind control.

Agriculture is Our Greatest Industry.

Great though the importance of these first three primary industries may be, none equals agriculture. Occasionally figures are published purporting to indicate the relative importance of different industries. These always appear to be based on monetary values. It would be difficult to conceive a more lop-sided or even topsy-turvy method of estimating values. Such an outlook leaves out of consideration the influence of the respective industries on national health and well-being, on the conservation of national assets and on the future of the country.

With a more rational consideration of values, it is clear that agriculture is not, as is sometimes said, one of our greatest industries, but it is beyond contradiction our greatest industry. This truth applies, not only to Australia, but to the world at large. It is the greatest industry in the world. War conditions have not created such a position, but they have made it more obvious.

Stock- and Crop-raising are Interdependent.

Agriculture is a very diversified industry, but may be roughly divided into two sections: plant raising and stock raising. These again are capable of very considerable subdivision, but no matter to what extent this subdivision may be made, all sections interlock to a greater or less extent. The lucerne grower contacts the horse breeder on the one side and the beekeeper on the other; the horse breeder sells horses to the sugar-cane farmer, who produces molasses to be fed to sheep; the sheep clean up the stubble of the wheat farmer, whose wheat feeds the metropolitan poultry.

The closer this interlocking takes place, the more likely is farming to be satisfactory, and where agriculture has reached its highest state of efficiency, there it will be found that the combination of stock and crops is most complete. In using the word "efficiency" here, it is not intended to convey the highest immediate gain, but the best and most permanent type of what is known as good husbandry.

Only under exceptional circumstances, such as exist in virgin lands newly occupied by a civilized race, or in semi-arid conditions such as are met with over much of inland Australia, or where land is held in very small areas for intensive vegetable growing, does this truth fail to apply.

Maintenance of Soil Fertility is Vital.

Now, whether the occupier of the land is engaged in crop raising or stock raising or both combined, the success of his operations depends on the fertility of the soil. Naturally the degree of his success will be influenced by other factors, such as his own knowledge and energy, his accessibility to markets, the fluctuations in demand for his products and so on, but behind all these lies the fertility of the soil.

Australia is not blessed with vast areas of very fertile soil; neither, in proportion to her size, was Denmark. The very manner in which Australia was settled militated against the conservation of existing fertility, and the two chief enemies to maintained soil value—exhaustion and erosion—have played an all too serious part in our subsequent history. These two deteriorating factors are closely allied. In a most enlightening article in the January, 1942, issue of *Endeavour*, G. V. Jacks, Deputy Director of the Imperial Bureau of Soil Science at Rothamsted, describes soil exhaustion as the invariable precursor of soil erosion. Jacks claims that "a fertile soil, wherever it is formed, has many of the properties of a sponge—it can absorb quantities of water and possesses considerable internal cohesion. An infertile or exhausted soil loses this water-absorbing capacity and cohesiveness and breaks down to a mass of separate particles in which condition it is very readily washed away by water or blown away by wind." All these things are happening in New South Wales, and the fundamental object of rural reconstruction here must be the arresting of these processes and, so far as is possible, reversing the process of exhaustion.

That this can be done is amply shown by the history of Great Britain and Denmark. The exhausted arable lands of those countries were turned over to stock raising with a combination of crop growing sufficient to provide certain stock foods, whilst large quantities of stock food were imported to the consequent enrichment of the land.

Soil Conservation Must Replace Soil Exhaustion.

Such a policy adopted in its entirety would be unthinkable here, but this country must ensure that such steps as are possible are taken to bring about the needed change. Everything which may be done to prevent soil erosion is so much to the good, but it is not a marked improvement if erosion is checked at one spot whilst all around exhaustion is being carried further. The

basal requirement is a change from soil exhausting agriculture to soil conserving agriculture.

This change will not readily be brought about, because soil conserving agriculture is more expensive and laborious than soil exploiting agriculture, and requires more knowledge. It is not, comparatively speaking, an expensive matter to ring-bark land, place a fence round it and run sheep or dairy cattle on the natural pastures. It does not require an undue amount of thought, though at times much labour, to clear land, fence it, plough it, and grow wheat year after year. But to work a farm properly with due regard to the maintenance of soil fertility requires knowledge and thought, energy and a forward-looking mind, and, in the early stages of operations, it also means more expense.

Community Interest is Essential.

Although the individual farmer may change his outlook and methods, he will be very greatly hampered if his neighbours do not do likewise. Water erosion illustrates the necessity for community action. In hilly country all the farmers on an eroding stream are concerned. To secure anything approaching full success, the whole course of that stream must be dealt with. There must be no place for exercise of individual rights. This community outlook must go much farther than this simple illustration.

This community interest in Denmark was brought about through the extraordinary capacity of the Danes for co-operation. It has been suggested that this aptitude for mutual "aid and control," which after all is what co-operation means, is an inherited tendency from past centuries during which the Danes were concentrated in village communities. In those communities, as Faber puts it, "most of the village affairs were regulated by definite rules, the peasants aiding and controlling one another."

In Australia, owing to the scattered nature of settlement, the dominant spirit was one of individualism, and there was, in the past, but little incentive outside the dairying districts to co-operative action except in the case of emergency, such as flood or fire. Under present-day conditions it is becoming obvious that community interest and co-operation should be brought into play to an increasing extent, not only where it has not yet been established, but also in the dairying districts where at least the basis is well developed. The success of co-operation in Denmark was brought about by the initiative and activities of the people themselves, without propaganda or assistance from the Government, and one of the striking features of the scheme was the loyalty of the co-operators to their societies. The machinery necessary for the extension of co-operation exists in this State, if not elsewhere in Australia.

The Nation's Interest in Farmers' Methods.

The fertility of our soil is the basis of our civilization, and in the interests of the community soil fertility must be maintained. It is from this angle that the farmer—the occupier of the land—is regarded as holding the land in trust for the nation, but if this high responsibility is placed on the farmer, then the people of the nation as a whole must recognize the fact that the trustee is worthy of his hire. Put in other words, the occupier of the land must be able to occupy the land under such terms as will enable him to maintain the fertility of the soil. Such a state of affairs has not existed, generally speaking, in this country. The terms of his occupancy have, too often, forced the occupier of the land to exploit it to the utmost in order to live, quite regardless of the effect of his actions on future generations or even on the later years of his own life.

The necessity for securing permanent dividends to the nation by soil conservation has been too little realized by governments, banks, financial institutions, and landlords. The land has been treated as though it were something inexhaustible. We are now learning that this is not the case, and if we do not grasp this lesson rapidly, the future of Australian agriculture, and therefore of Australia, will be unpleasant.

Use of Manures and Conserved Fodder.

The role of livestock in the rejuvenation of the land has already been indicated. The reaction to this must not be to assume that the more stock, the better the result. Overstocking can have as deleterious an effect as overcropping. The result of the judicious use of livestock can only be beneficial. In the exploitation of the land, Australians have tended to depend too much on artificial, inorganic manures for fertilisation. In a long-range policy, the high value of organic manure must be appreciated. These organic manures may be of animal or vegetable origin. The animal manures, both solid and liquid, are beneficial because, in the processes of digestion, the vegetable matter eaten is broken down and changed into a state which makes its constituent parts readily available for utilisation by plants. The value of animal manure does not lie wholly in the amount of plant nutrients contained, but in improving the moisture retaining power of the soil and so acting as one of the deterrents to erosion. But to produce good manure stock must be fed. By better feeding and better collection, it has been estimated by the Agricultural Council in Denmark that, in the thirty years ending in 1935, the amount of nutrients contained in farmyard manure has been almost doubled. Livestock in this country will not be better fed until fodder conservation becomes far more widespread and general and feeding becomes a routine procedure and not an attempt to keep stock alive during a drought.

It is argued, however, that the occupier of the land too often cannot afford to tie up his limited capital in conserved fodder. If our rural economy was rightly developed, the occupier of the land would be able to conserve fodder and feed his stock so that they, in their turn, would produce more valuable manure and become better agents in soil conservation and in maintaining a permanent dividend-producing asset for the nation.

Diversification Enables Conservation.

However, there is another factor to be considered in soil conservation. Jacks points out that it is "doubtful whether agriculture can ever become conservative so long as the farmer is concerned with adapting his practices more to the

requirements of a foreign market than to the limitations on land utilisation imposed by nature." That is a hard saying for a country like Australia which depends, in normal times, so largely on its export of primary products. The experience of Denmark indicates that it is not the whole truth. Denmark deliberately aimed at capturing foreign markets with her primary products and did so, yet at the same time conserved and enriched her soil. Nevertheless, Jacks' statement has sufficient weight and truth behind it to force us to consider the value of the home market. That is a stable market and in supplying it there is not necessarily an incentive to soil exploitation. The home market depends on the population of Australia.

Apart from that influence, the tendency towards self-sufficiency on the individual farm and in the agricultural community will diminish soil exploitation and increase conservation. The one-crop holding, whether it be wheat, wool or anything else, is more likely to be an exploiting holding—the diversified farm, a conserving holding. Where the main activity is on the livestock side, even if it is a one-crop activity, the conserving principle can be secured by judicious pasture improvement and management, careful stocking, fodder conservation and feeding. A farm so run, although exporting only one crop, is actually a multiple-crop farm, utilising its minor crops to produce the major one.

Agriculture and National Health.

The community as a whole should be keenly interested in this question from the point of view of national health. J. B. Orr, writing on nutrition and human welfare, has drawn attention to this fact. He wrote, in July, 1941: "The great improvement in health and physique in the United Kingdom in the last twenty years is indicated by an increase of 2 to 3 inches in the average stature of children leaving school, by the fall of the infant mortality rate in England from 97 per 1,000 live births in 1918 to 53 in 1938, and by the fall in the tuberculosis death rate from 15.7 per 10,000 living in 1918 to 7.2 in 1935. This improvement in the health of the people must be attributed to changes in controllable environmental factors, of which the greatest has been in food, and not in the hereditary make-up of the population." Discussing the question with a view to further improvement, Orr states that the first obvious step to be taken is to increase the national food supply to provide sufficient of the protective foods for the whole population. Amongst the most important protective foods he classes butter, milk and eggs. Professor J. C. Drummond, in 1942, talking on war-time nutrition and its lessons for the future, went so far as to describe milk as "a food that has been aptly described as the keystone of the nutritional structure."

Surely, if all this is correct, and there is no reason to doubt it, the community as a whole should be interested in the production of these things, and should see to it that the men who produce them are able to do so without destroying the value of the nation's asset—the soil.

The Basal Fact of National Structure is Soil Fertility.

An attempt has been made herein to demonstrate that the basal fact of our national structure is the fertility of the soil; that our present methods are soil exploiting, and that they must be changed to soil conserving. Incidentally, it is urged that the means whereby our agricultural policy may bring this about are through such changes in our rural economy as will enable the farmer to feed his stock; that diversification of farming should be kept in the foreground; that co-operation and community interest should take the place of individualism; and that an attempt should be made to make our urban populations appreciate that only through a prosperous rural community can this nation thrive.

R.A.S. Scholarship Tenable at Hawkesbury Agricultural College.

THE Minister for Agriculture, Hon. W. F. Dunn, announces that the Royal Agricultural Society's Scholarship, tenable in the Agriculture Diploma course at Hawkesbury Agricultural College, Richmond, will be open for competition in January next.

The award of the scholarship will be determined mainly on the results of the Intermediate Certificate examination, subject to consideration of the candidate's aptitude, fitness, physical strength and other qualifications necessary to become successful in agricultural work. Special consideration will be given to the aggregate marks obtained in six subjects at the examination mentioned, such subjects to include English, Maths. I, and four others to be selected from specified groups. The scholarship will be open for competition amongst candidates who are not less than sixteen or more than nineteen years of age on 3rd February, 1944, and who are natural-born or naturalised British subjects. Candidates or their parents must have had six months' continuous residence in this State immediately prior to 3rd February.

The duration of the scholarship is three years in the case of a holder entering the first year, and two years where he is qualified to enter the second year of the course, and will cover fees, cost of text-books and other expenses up to a maximum of £40 per annum. Any charges or expenses in excess of that amount will require to be met by the student.

Applications from persons desirous of competing for the scholarship must be lodged with the Secretary, Royal Agricultural Society of New South Wales, Endeavour House, 33 Macquarie Place, Sydney, not later than 5th January, 1944. Further particulars are obtainable from the Under Secretary and Director, Department of Agriculture, Box 36A, G.P.O., Sydney, or from the Principal, Hawkesbury Agricultural College, Richmond.

Keep on Buying War Savings Certificates.

THE HARVESTING AND THRESHING OF CUCURBIT SEED.

JOHN DOUGLASS, H.D.A., H.D.D.

NOW that Australia has launched a scheme to increase vegetable production greatly during the war years, it will be necessary for growers to become up-to-date in the technique of growing seed and also in the handling of the most modern machines to do the work.

The growing of many seed crops, particularly the cereals and some of the vegetables such as peas and beans, can be readily mechanised, with greater efficiency in harvesting and the production of higher quality seeds at reduced prices. However, it has been recognised, even in countries where vegetable seed is produced in large quantities, that the handling of the cucurbit crop demands a great deal of hand labour.

Special Seed-production Crops.

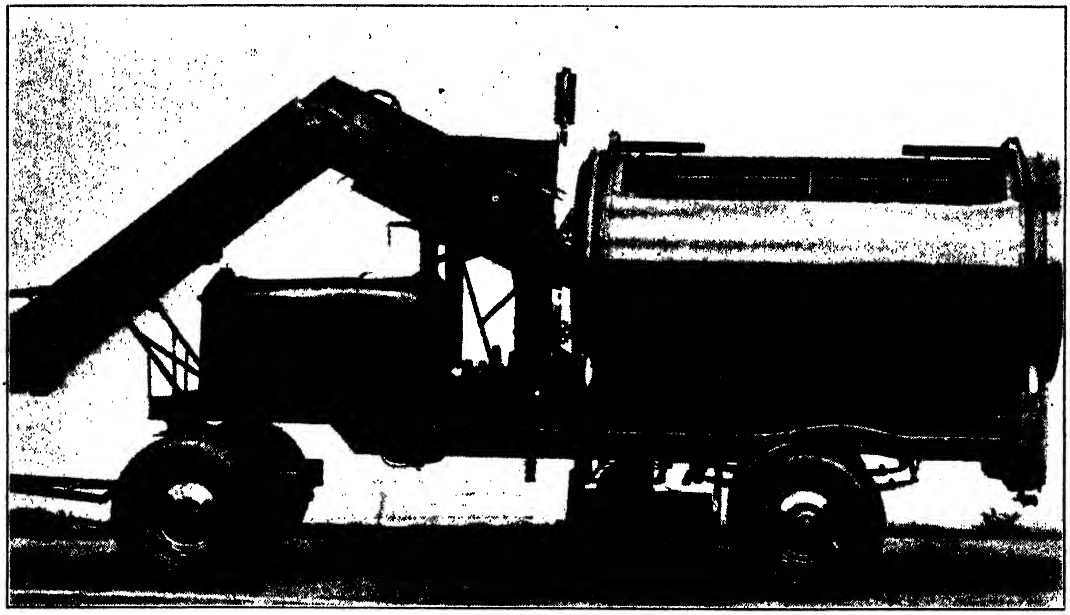
Australia has for many generations supplied her own requirements of seeds of pumpkins, and produced large quantities of her own watermelon and cucumber seed. Nevertheless, the production of these seeds has always been looked upon as a sideline by growers of these vegetables for market. The first lesson that Australians must learn in regard to vegetable seed production is that the production of vegetable seed crops must be a distinct operation from the production of vegetables for market. In the case of cucurbits, it is the only practical method of producing high quality seed on an economic scale. This system eliminates the great temptation to convert culls and unmarketable produce into seed. On the other hand, the growing of cucurbit crops specially for seed purposes allows for thorough culling of undesirable types, resulting in greatly improved seed.

Actually it is much cheaper to grow cucurbit crops specially for seed, as in the first place, only one harvesting of the crop is necessary—when the fruits are fully mature. When these crops are grown for market, the chief object is to obtain market-sized fruits.

The latest information from commercial growers in the United States is that the whole of the cucurbit crops can be planted for seed in rows much closer together than market crops, resulting in a greater total seed yield per acre. While in California recently, I examined rockmelon crops sown, by bean planting machinery fitted with special plates, eight rows at a time, each row

Field of Honey Dew Melons, showing Method of Placing Fruits. Ready for Threshing.

spaced 32 inches apart. The rate of seeding was 3½ to 4½ lb. per acre, while the seed was dropped along the rows two seeds at 18-inch intervals. The maturing crop showed the majority of the fruits to be of medium size, the majority being unsuitable for marketing. The seed yield, however, was very heavy, and showed the farmer an excellent return, although the contract price was only 32 cents per lb., which is approximately 2s. per lb. Australia. What has been done with rockmelon culture in the United States is being done with other crops, particularly with cucumbers, with great success.



Side View of Cucurbit Seed Threshing Machine.

Harvesting.

The great reduction achieved in harvesting costs is largely associated with the mechanical threshing and cleaning of cucurbit seed. The whole of the crop is allowed to remain in the field until it is fully mature and the vines destroyed by the first frosts. Workers then move through the field and throw the fruit into rows at convenient intervals. The fruits are left in the heap to mature further, but mechanically threshed before becoming over mature.

An Up-to-date Threshing Machine.

The method of threshing cucurbits (and also tomatoes) is to crush the fruit and then sieve the seeds and juice from the hulls and pulp. The Ferry Morse Seed Company, one of the leading seed firms of the world, has just completed a most up-to-date and economically operated machine for doing this job. The accompanying illustration shows the whole arrangement on the chassis of a motor truck. It will be seen that the elevator in the front of the machine conveys the fruit to the crusher, which is situated above the driving seat. The crusher is adjusted according to the vegetable being threshed, so that the fruit is crushed, but not mashed. The mass is then conveyed to a cylinder, which rotates, and allows the seeds and juice to fall into a tray underneath, while the hulls are thrown out of the end of the cylinder to the field. The screens are adjustable. It has been found that ½-inch screen is suitable for cucumbers, rockmelons and watermelons, while a ⅝-inch screen is necessary for pumpkins, summer and winter squash.

A 1½-inch centrifugal pump is fitted to the side of the car, with a long hose which can be dropped into irrigation channels. The water is used for the thorough washing of this machine when changing varieties.

The Ferry Morse organisation has also a cylindrical brushing machine which operates in water and removes the flesh from

(*Continued on page* 516.)

Can Prices be Based on Cost of Production?

W. H. PAWLEY, B.A.,
First Assistant, Division of Marketing and Agricultural Economics.

IT is frequently contended that the price for rural products should be based on the cost of production. This statement appears so fair at first sight that I can quite understand why its advocates are surprised that anyone should wish to question it. A little thought, however, will show that the position is not nearly as simple as it appears.

If every farmer had the same production costs, it would be possible to agree that price should be fixed on the basis of "cost plus" for the industry. Unfortunately, there is a wide range of production costs in every rural industry. The Wheat Commission, for instance, found a wheat production cost ranging from 1s. 1d. to 19s. 11d. a bushel, incredible as it may seem!

It is commonly said, "Oh well, the average cost then." But this would be extremely unfair to an industry, since it is usual with an average that about half are below it and half above it. An average is no more than a mathematical abstraction. To use the Wheat Commission again, the average cost (for whatever it is worth) was found to be 3s. 6d. per bushel at that time; but it was costing 40 per cent. of the farmers more than 3s. 10d. a bushel to produce wheat, 20 per cent. more than 4s. 8d. and 10 per cent. more than 5s. 10d. To fix price at the average cost is to condemn approximately half the farmers to carry on at a loss—or get out. Surely we have not twice as many farmers as we need!

What cost shall we take then? No one will reasonably contend that the consumer should be taxed to cover the costs of the most inefficient producer, or the producers trying to carry on in quite unsuited localities. What we really need to know is: "How many farmers are needed in each industry to supply the needs of the market without depressing prices below the production costs of those producers that remain?" We then need to assure the farmers who are needed, a price which will cover the production costs (including a fair profit) of the highest cost or marginal producer—not the average man. Price should cover everyone's production costs, after excluding uneconomic production.

Production is uneconomic if it costs more than it brings over an average of years. Uneconomic production is not net wealth, because it is using up more wealth than it creates. Only the demand of consumers, as shown by the quantity of a commodity the market wants and the price it is prepared to pay, can be the arbiter in this matter. Consequently, we are really basing the price on the market, and not on production costs, when we fix a price high enough to cover the costs of all except non-economic producers. In my opinion, this is the better way to look at it.

Nevertheless, while price should be based on the market in the long run, it does not follow that it is desirable to have farmers suffer year to year fluctuations in open market prices. Instability of prices is wholly an evil—an evil for the consumer as well as the producer. By all means, let us have a fixed price, but it must be fixed at approximately the long-term market level, insofar as we can estimate this in advance. The actual market prices should be received by a marketing organisation, and the farmer given a price which, over an average of years, leaves the stabilisation fund neither a gainer nor a loser.

However, the policy of considering what production costs the market will stand must be tempered with caution if the market is already depressed by uneconomic production in other countries. In this case, we cannot afford to let producers who will be needed in the long run, be ruined, simply because the market is temporarily disordered. This is, however, a qualification, not an abandonment of the principle that prices should determine what costs are economic, instead of taking costs (which costs?) as the determinant of prices.

A fair, stabilised price would amount to cost plus for that part of the industry which is really producing net wealth for the country. It is not possible to apply the principle of cost plus to individual farmers, partly because there is such a wide range of different costs, and partly because no one knows much about the costs of each individual farm.

Approved Seed—November, 1943.

To assist in the production and distribution of approved seed of recommended varieties of crops and vegetables, the Department publishes in this list each month the names and addresses of growers of such seed. For this service a charge of 2s. 6d. is made for each insertion of each variety listed. The number of varieties listed on behalf of each grower will be restricted to twenty-five for the time being. The Department may inspect the crop producing the seed, and in all cases a sample of the seed must be sent to the Department of Agriculture with information as to the location of its production, and must be accompanied by the fee indicated above.

If any seed producer does not wish to pay the advertising charge he may submit his name with the variety of seed and sample to the Department, and if it is approved his name will be listed in the Department and information will be supplied regarding it to inquirers.

Maize.—
Fitzroy—Manager, Experiment Farm, Grafton (10s. per bus. f.o.r. Grafton).

Broom Millet.—
Manager, Experiment Farm, Bathurst. (6d. per lb.).

Tomatoes.—
Potentate—Rumseys Pty. Ltd., Church-street, Parramatta.

Cauliflower.—
Shorts—H. Burton Bradley, Sherwood Farm, Moorland.

Parsnip.—
Yates' Hollow Crown—Arthur Yates & Co. Pty. 184 Sussex-street, Sydney.

Garden Peas.—
Greenfeast — Mr. S. Lee Archer, "Ebenezer," Tumorrama, via Tumut.

Beet.—
Yates' Derwent Globe—Arthur Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.

Cabbage.—
Yates' Vanguard—Arthur Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.
Yates' Derwent Re-selected Early Drumhead—Arthur Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.

Cucumber.—
Early Fortune—Arthur Yates & Co. Pty., Ltd., 184 Sussex-street, Sydney.

Pumpkin.—
Yates' Re-selected Queensland Blue — Arthur Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.
Yates' Re-selected Triamble—Arthur Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.

Swede.—
Yates' Champion Purple Top—Arthur Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.

Varieties of Approved Seed Available.

IN order that farmers may be directed to what are regarded by the Department as the most satisfactory local sources of approved seed of recommended commercial varieties of farm crops and vegetables, the Department is willing to supply information concerning such sources of seed of the following varieties:—

Maize.—
Golden Superb, Golden Nugget, Golden Beauty and Leaming.

Grasses, etc.—
Phalaris tuberosa, Subterranean Clover (mid-season), Sheep's Burnet, Lucerne, Sudan.

Cotton Seed Available for Experimental Areas.

ALTHOUGH experience of cotton growing in New South Wales is still too limited and information regarding yields and production costs insufficiently complete to warrant its unconditional recommendation as a commercial enterprise in any particular district, there are many areas which should be suited to this now vitally important crop, and there is obvious need for the earliest determination of those which promise payable production. Sowing is now seasonable, and seed of suitable varieties is again available this season, free of charge, for experimental areas up to 1 acre in size to applicants in all likely districts.

Arrangements will be made, if desired, to market all acceptable crops of at least 1 cwt. In return, growers are requested to keep records of crop treatment, climatic conditions, and yields, and to forward these, together with a 2-lb. sample of the cotton as picked, at the end of the season.

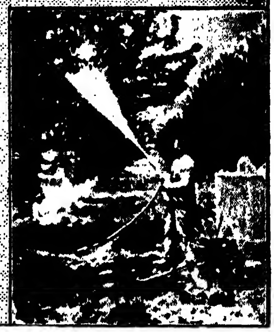
Some ninety growers, including some schools, planted trial plots of cotton during the past season, in all likely districts from Hay to Tenterfield, and from Casino to Moree. Seasonal conditions were unusually adverse, but good crops were harvested in some favoured districts and under irrigation. The quality of the cotton produced was generally good, and in some cases, excellent. A few crops of sufficient size to warrant transport were marketed by the Department on behalf of growers. Most of last season's experimenters have stated their intention of trying again, and a few successful growers are expanding their planting to commercial size.

In Queensland, which in normal times produces about one-third of Australian requirements, and where a vast expansion in cotton culture is now taking place, a great deal of the cotton produced is grown in relatively small areas of 2 to 10 acres as a profitable sideline to other farming operations. The crop might well be employed in a similar manner in some districts of New South Wales. A leaflet on cotton culture is obtainable free, on application to the Department of Agriculture, Box 36A, G.P.O., Sydney.—W. H. POGGENDORFF, Plant Breeder.

PLANT DISEASES

Notes contributed by the Biological Branch

Division of Science Services



Leaf Mould of Glasshouse Tomatoes.

Importance of Periodic Fumigation.

LEAF mould or mildew is one of the most serious of the fungous diseases with which the grower of glasshouse tomatoes has to contend. The chief damage occurs on the foliage, but flowers and young tender stems may occasionally be attacked.

The disease appears as small, circular, powdery, white patches on the undersurfaces of the leaves; these patches enlarge rapidly, the colour changing to pale buff and finally to light brown. The spores of the fungus are produced on these areas in very great numbers, giving the colour to the spots as they mature. The spores are very small and light and easily dislodged, and are readily spread by air currents. The upper surface of the leaf over the affected area becomes yellow, and as the disease progresses the affected areas die out. Flowers which have become infected fail to set fruit.

The intensity of the disease varies to a certain extent with the seasons, warm temperatures and high humidity being most conducive to a severe attack.

Control.

Regulation of watering and ventilation with a view to reducing humidity is of importance in limiting mildew development, but this alone cannot achieve control, especially in a rainy season. The only spray which gives a satisfactory degree of control is Shirlan A.G., used at the rate of 1½ lb. (1 pint) to 40 gallons of water. The whole plant must be thoroughly wetted, particular attention being paid to the lower surfaces of the leaves. It is essential that spraying commence early, as once the disease becomes well established it is doubtful whether good results will be achieved from spraying. Commence treatment, therefore, a few weeks after transplanting, and continue at fortnightly intervals for as long as practicable.

Fumigation of the Glasshouse.

The disease carries over from crop to crop by means of spores which have lodged in various parts of the glasshouse. Disinfection of the house is, therefore, an important sanitary practice which obviously should contribute to the control of leaf mould during the succeeding season. The destruction of the mould before cleaning out the old vines is preferable to fumigating the cleaned houses, since it prevents reinfection from discarded vines outside.

One of the simplest and cheapest methods of fumigation is by burning sulphur. This produces sulphur dioxide gas which has been found consistently effective in killing

the leaf mould spores. The sulphur is distributed in heaps of about ½ lb. on the glasshouse floor. It is readily ignited if a small quantity of methylated spirits is poured on the centre of each heap.

Before commencing to fumigate, the glasshouse should be sealed down as completely as possible. The sulphur can be used at the rate of 1 lb. per 1,000 cubic feet of glasshouse space. Leakages in the house may be compensated for to a certain extent by increasing the dosage. If, however, there are any galvanised surfaces, iron pipes or paints containing zinc, the dosage should not exceed 4 lb. sulphur to 10,000 cubic feet, since chemical reactions take place between these substances and the gas, and the residues produced are soluble in water and may injure subsequent crops by dripping on them.

The greenhouse should be dry during fumigation. Sulphur dioxide fumigation at the end of the crop is also considered of value in the control of a number of insect pests.

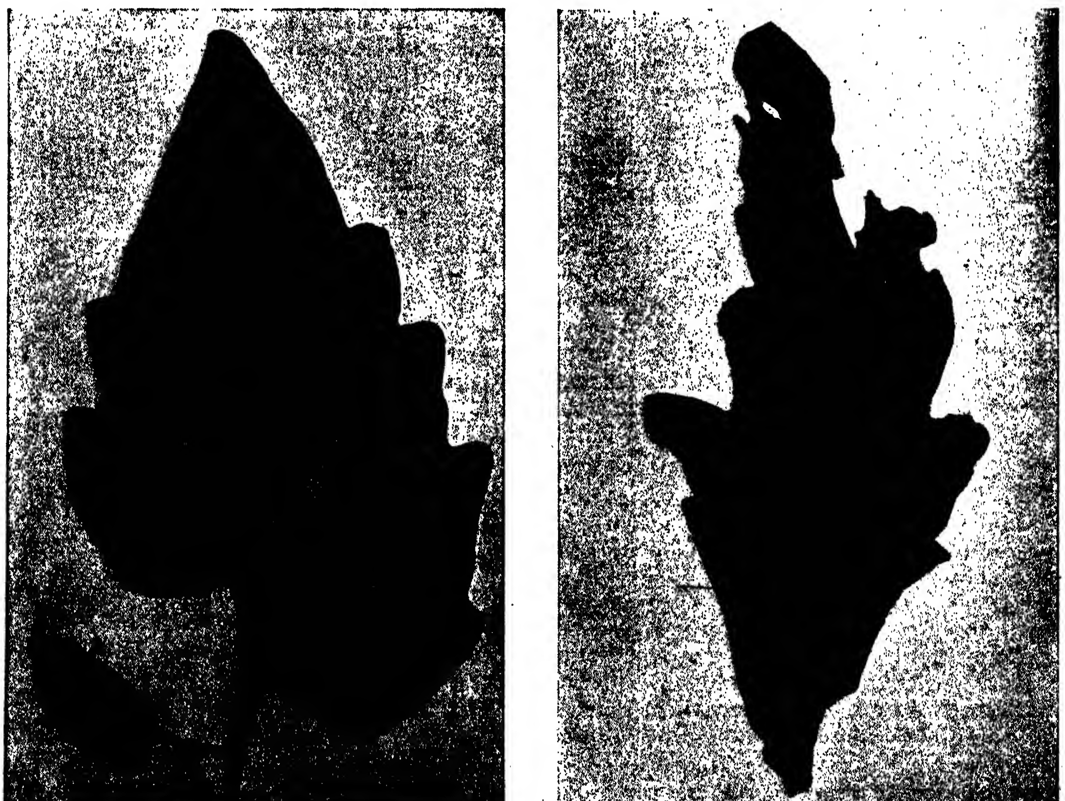
Lichen Growth on Fruit Trees.

THE Biological Branch is frequently asked for information as to the method of getting rid of lichen growth on fruit trees.

The lichens are not actually harmful to the tree on which they grow, since they are entirely superficial, and the same kinds can be seen on fences and dead trees. They are, however, unsightly, and are often the sign of a neglected orchard, since the regular routine spraying necessary for such diseases as apple and pear black spot, peach leaf curl, etc., are sufficient to keep lichen growth in check. To kill the lichens, spray with Bordeaux mixture 6-4-40, copper oxychloride 1 lb. to 20 gallons, or lime sulphur 1-20. The spray application should preferably be made on a warm dry day when the trees are dormant.

Scurf or Soil Stain of Sweet Potatoes.

SCURF, or soil stain, is the commonest disease of sweet potatoes in this State. Small brown spots appear on the potatoes and may



Tomato Leaves Affected with Leaf Mildew

later increase in size and coalesce to cause a uniform browning of their entire surfaces. The discolouration is only superficial, but the disease may result in shrivelling of potatoes kept in storage. The injury to the skin facilitates the escape of moisture from the potatoes, which may crack and thus permit the entry of rot-producing organisms.

The disease is caused by a fungus, *Monilochates infuscans,* which over-winters on the seed and decaying vines in the field. Alkaline soils and heavy wet soils containing a large amount of organic matter favour the development of the disease.

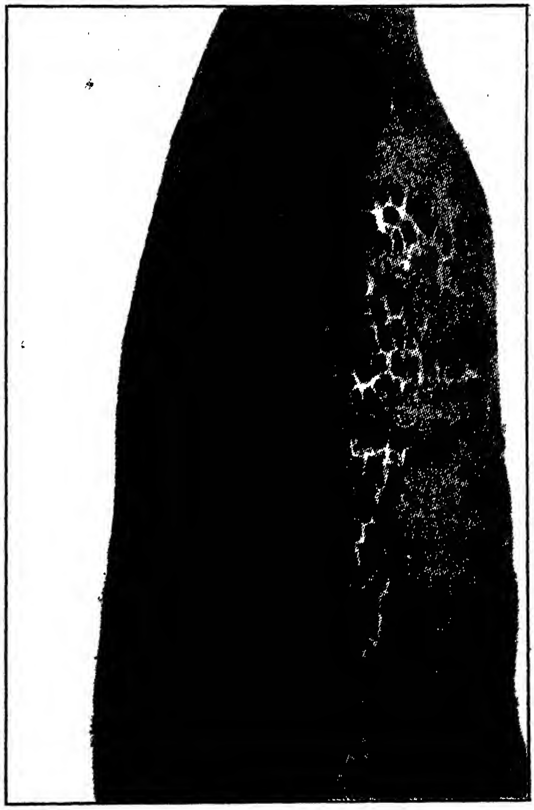
Control measures may be summarised as follows:—

1. Use only clean "seed."

2. Dip seed for 10 minutes in corrosive sublimate solution (1 oz. to 8 gallons of water). Dissolve chemical in a little hot water and make up to required volume. Use wooden, enamel or earthenware containers for the solution and keep it out of reach of children and farm animals. After treatment the seed should be bedded.

3. On infected land practise rotation of crops.

4. Use clean soil in the seed-bed and avoid manure containing sweet potato refuse.



Sweet Potato Tuber Showing Cracking of the Surface Caused by the Scurf Organism.
[*After Harter and Weimer.*

Brown Rot of Peaches, Nectarines and Plums.

THE wet weather of early spring was extremely favourable for the brown rot fungus, and cases were observed of green fruit being affected.

The blossoms provide a point of entry for the fungous spores and enable the disease to gain a hold on the tree as blossom or twig blight. Even a few such primary infections are sufficient to serve as focal points for an epidemic of rot later when the fruit is ripening.

If the weather favours the disease, apply commercial lime sulphur, 1-160 (1 oz. in 1 gallon of water) just prior to or during picking.

Peaches Destroyed by Brown Rot.

Black Spot and Downy Mildew.

VIGNERONS who have neglected to spray to protect their vines from attack by black spot and downy mildew, should make an immediate application of Boreadux mixture (6-4-50).

New Plant Diseases.

DURING the six months ending 30th September, 1943, the following diseases were recorded for the first time in New South Wales:—

Chrysanthemum cinerariifolium, pyrethrum. *Sclerotinia sclerotiorum* (sclerotinia blight), Hay.

Citrus spp. *Cephaleuros mycoidea* (algal leaf spot), Narara.

Cucumis sativa, cucumber. *Septoria cucurbitacearum* (leaf spot), Gosford.

Gerbera jamesonii, gerbera. *Rhizoctonia solani* (root and crown rot), Lismore.

Impatiens balsamea, balsam. *Oidium* sp. (powdery mildew), Metropolitan.

Pisum sativum, pea. Pea virus I (enation pea virus), Cowra.

Podalyria sp., podalyria. *Verticillium* sp. (wilt), Metropolitan.

Watsonia sp., watsonia. *Botrytis* sp. (leaf spot), Metropolitan.

Agricultural Bureau Scholarship Re-established at Hawkesbury Agricultural College.

THE Minister for Agriculture and Forests (Captain the Hon. W. F. Dunn, M.L.A.) has much pleasure in announcing that the Advisory Council of the Agricultural Bureau of New South Wales has decided to re-establish its Scholarship tenable in the Agriculture Diploma Course at the Hawkesbury Agricultural College.

The award of the Scholarship, which will be open for competition in January next, will be determined mainly on the results of the Intermediate Certificate examination, subject to consideration of the candidate's aptitude, fitness, physical strength and other qualifications necessary to become successful in agricultural work. Special consideration will be given to the aggregate marks obtained in six subjects at the Intermediate Certificate examination, such subjects to include English, Maths. I, and four others to be selected from specified groups.

The scholarship will be open for competition amongst candidates who are not less than 16 or more than 19 years of age on the 3rd February, 1944, and who are natural-born or naturalised subjects of the King. Candidates or their parents must have had six months' continuous residence in this State immediately prior to 3rd February next.

The duration of the Scholarship is three years in the case of a holder entering the first year, and two years where he is qualified to enter the second year of the course, and will cover fees, cost of text-books and other expenses up to a maximum of £40 per annum. Any charges or expenses in excess of that amount will require to be met by the student.

Applications from persons desirous of competing for the Scholarship must be lodged with the Principal, Hawkesbury Agricultural College, Richmond, not later than 5th January, 1944. Further particulars are obtainable from the Under Secretary and Director, Department of Agriculture, Box 36A, G.P.O., Sydney, or from the Principal of the College.

Fire Risks from Old Nitrate of Soda Bags.

IN view of the large quantities of nitrate of soda now being purchased by commercial and household vegetable growers, attention is directed to the risk of fire, if jute or paper bags are handled carelessly after this fertiliser has been removed. The advent of dry, hot weather will increase this risk.

Containers which have absorbed moisture from nitrate of soda are particularly dangerous under the following conditions:—

(*a*) Where they have become dry following stacking in a warm, dry atmosphere.

(*b*) Where they are exposed to sun and wind. Rapid drying on a hot day may result in spontaneous combustion.

These risks are increased by the presence of other inflammable materials in direct contact or in the vicinity. Special care is necessary where the fertilisers are stored in garages.

Vegetable growers and orchardists handling nitrate of soda in large quantities are strongly advised to wash old bags in several changes of water to remove all traces of fertiliser. On no account should unwashed bags be used for other purposes.

Householders are advised to destroy paper bags and packets after the fertiliser has been removed, and on no account to have them in places where matches or cigarette ends may be thrown, or where there is inflammable material of any description.

During the winter months, or when the atmosphere is moisture-laden, fire risk is reduced because of the moisture absorbed from the atmosphere by the residues of nitrate of soda held in the containers.—A. W. S. MOODIE, Fertiliser Rationing Officer.

The Home Preservation of Fruit Juices.

E. G. HALL, B.Sc.Agr., Fruit Research Officer.

THE home preservation of citrus juices, which are the most difficult to handle, was described in the October issue: this month the preservation of juices from stone and berry fruits will be dealt with.

Stone Fruits and Berries.

Whereas citrus juices should not be filtered clear, other juices may be prepared as three types, depending on the amount of solid material left in the juice:—

(*a*) Brilliantly clear juice, prepared by clarification and fine filtering—such as most commercial apple and grape juices.

(*b*) Cloudy juice, prepared by ordinary pressing and filtration as by straining through relatively fine cloth—such as cloudy apple, grape and pineapple juices.

(*c*) Pulpy juice, prepared with a screening or macerating device or by coarse straining so as to retain a considerable amount of fine pulp in the juice—such as apricot and tomato juices.

Apart from their attractive appearance, brilliantly clear juices are not desirable, as they have less flavour and less vitamin value than cloudy or pulpy juices. They are also difficult to prepare under home or farm conditions; therefore, home preserved juices should be either cloudy or pulpy.

Fruit syrups, which can be used for flavourings, or for drinks by dilution with four or five parts of water, soda water or milk, can be prepared from fairly acid, highly-coloured and strongly-flavoured fruits such as berries and some varieties of plums, by the addition of ½ to ¾ lb. sugar to each pint of juice after extraction. The addition of sugar helps considerably to preserve flavour and colour and 1 or 2 oz. of sugar to the pint can be added with advantage to nearly all juices.

Selection of the Fruit.

The fruit used should be at the soft, eating-ripe stage, and should be tree ripened for the full development of flavour and colour; if either greener or over-ripe fruit is used the juice will be of poor quality. It must be sound, clean and well washed and all utensils used must also be scrupulously clean to reduce initial contamination of the juice to a minimum.

Apricot, Peach and Nectarine Beverages.

Because of their pulpy nature these are not strictly juices. As the pulp of apricots and yellow peaches, in common with other yellow-fleshed fruits, is rich in carotene, which has a high vitamin A value, the incorporation of a fair amount of pulp in the juice increases the vitamin content and it also improves the flavour of the juice.

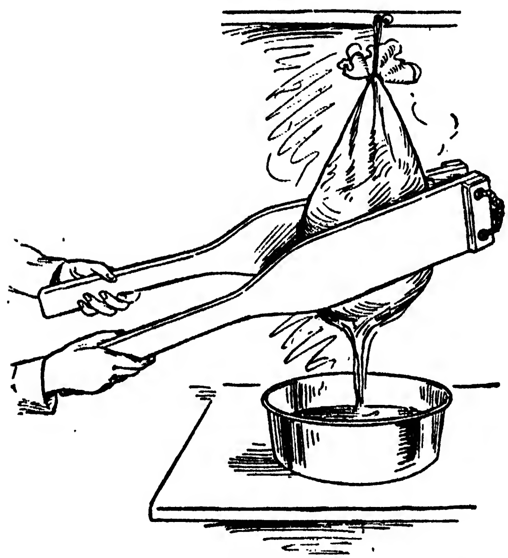
The later varieties of apricots, which have better quality, are better for juice than the earlier varieties. Peaches for juice should be yellow-fleshed, highly-flavoured and preferably free-stones. The best variety for juice is J. H. Hale, and Elberta is also good; but the canning types of clingstones are not satisfactory as they are too weak in flavour.

Peach juice is not as good a product as the apricot and nectarine juices, being inclined to be weak in flavour and to develop bitterness; however, it is quite satisfactory if only fully tree-

ripened fruits of J. H. Hale or Elberta are used and if the preparation and processing are carried out rapidly. Pulpy apricot juice is an attractive product which blends well with other juices, particularly orange and pineapple. Nectarines make a very good pulpy beverage.

Preparation.

The soft, ripe fruit should first be thoroughly washed. Peaches should then be peeled by steaming for 4 minutes or by holding in boiling water for 2 minutes, after which the skins can be rubbed off; apricots and nectarines do not require peeling. The fruit is then halved, pitted, crushed and placed immediately in an aluminium or enamel pan, containing an inch of water, the pan having been placed on the stove and the water brought to the boil. If a large quantity is being done the fruit should not be crushed but merely quartered and dropped immediately into



Hot-pressing Juice with the Aid of a Nut-cracker Type of Press.

[*After Dearing.*

the pan to minimise waiting before heating, as peaches and nectarines, especially if crushed, quickly turn brown in the air. Rapid heating of the fruit, after cutting, to destroy the enzyme which causes the browning is essential. If there is any delay between peeling and heating, the quartered fruit should be held in cold water or preferably in a weak acidified syrup (2 lb. sugar and 1½ oz. citric acid per gallon). The fruit should be heated to 160 deg. Fahr. and kept at that temperature for 15 minutes, being well stirred to break up the pulp as much as possible. While hot the pulp is pressed through a single thickness of cheese cloth or butter muslin and as much juice as possible strained out by squeezing and working the cloth holding the pulp with the hands. This can also be done by folding the cloth over the pulp after the first juice has stopped running through, holding in the hands and twisting the ends of the cloth in opposite directions. The cloth can also be gathered up in the form of a bag and pressed, as illustrated, between two boards, like large butter pats which are hinged with rope through holes at the wide end, to remove the remaining juice. If the juice is too thick and pulpy it should be mixed with about half its volume of clearer juice obtained by pressing the pulp through a double thickness of cheese cloth.

Sugar is then added to the juice at the rate of ½ lb. to the gallon (2 ounces to the pint); more sugar can be added if desired.

Hot-Fill Processing.

The juice is then put back into the pan, heated rapidly to 170 deg. Fahr. (when steam first appears), with constant stirring to minimise scorching. It can also be heated in a double saucepan with occasional stirring. The hot juice is filled immediately into hot bottles to overflowing. The bottles are then sealed and stood upside down on wooden slats, bags or cloths in a hot water bath at 170 deg. Fahr., in which they are kept for 30 minutes. They are then taken out, cooled away from draughts, which may cause the bottles to crack, and then stored in the coolest dark place available. Cooling should be done as quickly as possible without cracking the bottles and can be done more quickly than in the air by *slowly* running cold water into the vessel and allowing it to overflow, thus *gradually* replacing the hot water with cold.

The bottles are prepared by first thoroughly cleaning and sterilising, as described for citrus juices last month.

Plum Juice.

Plums can either be prepared as a pulpy juice, as described above for apricots and peaches, or as a cloudy juice, as described below.

The selection of varieties is important. For a good juice a plum should have a rich colour and flavour and a fair amount of acid. The Diamond plum is good, and Satsuma is satisfactory because of its rich flavour, although red varieties tend to give a brownish-looking juice. Yellow varieties with a rich colour give a more attractive juice, but are often somewhat weak in flavour and acid. The addition of sugar to the juice is more important than with apricots and peaches, as unsweetened juice loses too much flavour and becomes rather bitter; from 1 to 2 lb. of sugar should be added to each gallon of juice.

To prepare a cloudy juice the fruit has to be heated more than for a pulpy juice, in order that it can be readily filtered. The plums should be well washed, crushed and heated with 1 pint of water to 5 lb. fruit to 180 deg. Fahr. (a little hotter than when steam first appears), and held at that temperature for 30 minutes, with intermittent stirring to prevent any burning and to break up the pulp. The pulp is squeezed through coarse linen, cheese cloth or butter muslin, as outlined for cloudy apricot juice, and then strained through fine linen or several thicknesses of cheese cloth or muslin to remove most of the fine pulp.

The juice is then heated to 170 deg. Fahr. and processed at that temperature for 30 minutes by the hot fill method described above.

Sweetened plum juice makes a very good drink diluted with three parts of water to one of juice and served cold. It is much improved by the addition of a small amount of fresh orange juice when serving.

Prune Juice.

The health value of prunes can be obtained in a more attractive form by serving prune juice, which is more correctly an extract of prunes made by extracting dry prunes several times with boiling water.

1st Extraction.—Wash the dry prunes, add 2½ pints of water to each pound of prunes, and simmer with the lid on for 2½ hours, drain and keep the liquid.

2nd Extraction.—Add 1½ pints of water for each original pound and simmer again for 1 hour, drain and keep the liquid.

3rd Extraction.—Add 1 pint of water for each original pound and simmer again for 1 hour, drain and keep the liquid.

Combine the three extracts and add the juice pressed out from the prunes remaining. The juice can be concentrated by boiling, if desired, and is improved by adding lemon juice to taste, and is then hot filled and processed at 170 deg. Fahr. for 30 minutes, as outlined above for apricots.

A good juice can be prepared from fresh prunes by following the procedure given for plums, with the exception that it is not necessary to add more than ½ lb. of sugar per gallon of juice.

The d'Agen variety makes a better juice than the Robe, and small, undergrade prunes can be made use of by turning them into juice.

Cherry Juice.

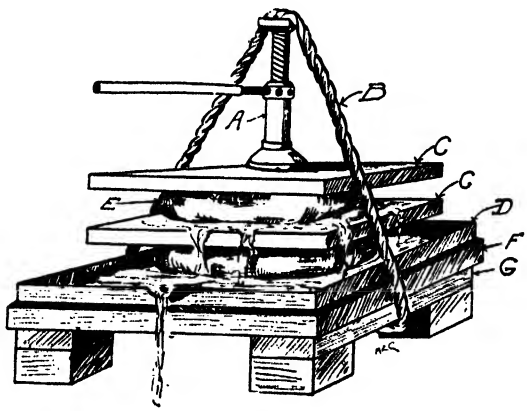
The best juice is obtained from sour or pie cherries, which are not grown commercially in this country, but a good juice can be prepared from sweet cherries. The most satisfactory varieties of sweet cherries for juice would probably be Florence and St. Margaret.

To get a good yield of well-coloured juice it is necessary to heat the cherries before pressing, but the flavour of such hot pressed juice is more like that of stewed cherries. It is, therefore, usually best to mix hot pressed juice with an equal volume of cold pressed juice, which has a better flavour but a poorer colour. Heating before pressing coagulates the pectins in the juice, after which it can readily be filtered clear. Cold press juice requires treatment with a pectic enzyme preparation* to coagulate the pectins before filtering, otherwise filtration will be difficult, the juice will remain dull and cloudy and the pectins will settle out as a deposit in the bottle during storage. If this is not regarded as a serious objection, the enzyme treatment can be omitted; or only hot pressed juice may be used if filtration of the untreated, cold pressed juice is found to be too difficult.

To obtain a satisfactory yield of juice, cherries, in common with many other fruit, such as apples, grapes and pineapple, must be pressed under considerable pressure. Commercially, this is usually done in a rack and cloth press operated hydraulically under a pressure of several tons to the square inch. On the farm it can be done with a home-made press in which the pressure is applied by a strong jack; a simple press of this type is illustrated on this page.

Hot Pressing.

Crush the whole cherries, taking care to crush only a few of the pits, as these will be sufficient for flavouring. Heat to 150 deg. Fahr. in an aluminium or enamel pan with half an inch of water on the bottom, and hold at that temperature for 15 minutes; then press out the juice and filter through several thicknesses of muslin or cheese cloth.



Home-made Fruit Juice Press.
A.—Heavy jack. B.—One-inch rope. C.—Two-inch timber. D.—Tin-lined or wooden pan with spout. E.—Heavy cloth to hold fruit. F.—Floor of 2-inch or 3-inch material. G.—Frame of 6 inch x 2-inch lumber.

[*After Cruess.*

Cold Pressing.

Crush as above, press, filter through double muslin or cheese cloth, heat to 160 deg. Fahr.; cool immediately to 120 deg. Fahr. and add one level tablespoon of Pectinol M to each 5 gallons of juice, then cover with a cloth and allow to stand and settle for 6 to 12 hours. The clear juice can then be syphoned off and the residue at the bottom filtered through several thicknesses of muslin or other fine cloth.

Equal parts of hot- and cold-pressed juice are mixed and 1 lb. or 2 lb. of sugar is added to each gallon; if about ½ ounce of citric acid or one cup of lemon juice is added to each gallon, the juice is further improved. The juice is then heated to 170 deg. Fahr. and processed at that

* Pectinol is the only pectin enzyme preparation for juice clarification at present on the market, and limited supplies are available from Robert Bryce and Co. Ltd., 188 Kent-street, Sydney.

temperature for 30 minutes by the hot fill method. If a very clear juice is required the hot pressed juice should also be clarified with Pectinol.

Berry Juices.

Loganberries, black currants, blackberries, and raspberries make good juices. The fully ripe berries are sorted, washed, crushed and heated to 150 deg. Fahr. in an aluminium or enamel pan with ½ inch of water on the bottom, with stirring to mash the berries, and held at that temperature for 15 minutes. Press immediately, preferably in a rack and cloth press, such as that illustrated; if such a press is not available then the berries could be pressed through coarse linen, or double cheese cloth between two boards, as described and illustrated previously.

Then heat rapidly to 190 deg. Fahr. and cool quickly; stand overnight to settle, and in the morning the clear juice can be syphoned off and the bottom liquid filtered through a jelly bag or several thicknesses of butter muslin or cheese cloth, after which the two lots of juice are mixed, 1 lb. or 2 lb. sugar being added to each gallon of juice (black currant will probably need more) and thoroughly dissolved; then heat to 170 deg. Fahr. and process at that temperature for 30 minutes by the hot fill method.

Berry Fruit Syrups.

On account of their rich flavour, strong colour and acid character, berry fruits are most suitable for the preparation of syrups. The procedure is the same as for berry juices except that 4 lb. to 6 lb. sugar is added to each gallon of juice. This greater amount of sugar gives a better retention of colour and flavour. After the sugar has been thoroughly dissolved, the juice should be strained again before processing to remove any fibres which may have been in the sugar and to clear the juice further.

Preservatives.

If the juices or syrups are required to keep for more than a day after opening, preservative should be added immediately after filtering, by dissolving in a little water and stirring into the juice. It is recommended that 1 grain of sodium benzoate and 2 grains of sodium metabisulphite or potassium metabisulphite be added to each pint of juice.

Last month's article should be consulted for further information on preservatives and for general considerations applicable to all juices. The alternative cold fill method of processing has not been suggested for the juices discussed this month, as the hot fill method is preferred in these instances.

(To be continued.)

Selected Citrus Buds.

The Co-operative Bud Selection Society, Ltd.

FOR some years it has been recognised that in most citrus groves there are trees that rarely produce sufficient fruits to be payable, whilst other trees are more constant producers of good quality and payable crops, so that with a view to enabling nurserymen to supply trees of the most productive and remunerative standards to planters, the above Society was formed under the aegis of the Department of Agriculture, and consists of representative fruitgrowers and nurserymen. The Society does not and cannot make profits, but merely exists to improve the fruit-growing industry by making available for budding selected buds from special trees of the best type of quality fruit and of reputed good bearing habit only. Trees from such buds should undoubtedly be more profitable and appeal to all progressive orchardists.

The Co-operative Bud Selection Society Ltd. supplied the following selected buds to nurserymen during the 1942 budding season, trees from which should be available for planting during the 1943 season :—

Nurseryman.	Washington Navel.	Valencia.	Marsh Grape-fruit.	Wheeny Grape-fruit.	Eureka Lemon.	Lisbon Lemon.	Emperor Mandarin.	Thorny Mandarin.	Total.
Adamson, T., Ermington ...	4,000	4,000	...	...	2,000	...	...	...	10,000
Cambourn, H., Gosford... ...	2,000	2,000	...	...	1,000	...	200	...	5,200
Catt, F. D., Carlingford ...	3,000	5,000	1,000	...	3,000	500	...	...	12,500
Eyles, A. T., Rydalmere ...	4,000	5,000	2,000	...	...	1,000	...	...	12,000
Ferguson, E. H., Wyong ...	2,000	2,000	...	...	1,000	...	...	...	5,000
Ferguson, F., & Son, Hurstville	1,000	1,000	...	...	...	...	...	...	2,000
Rosen, L. P., & Son, Carlingford	10,000	16,000	4,000	1,000	6,000	2,000	1,000	...	40,000
Spurway, F. E., & Sons, Ermington	4,500	3,500	1,000	...	750	250	...	...	10,000
Weare, A. J., Griffith	3,000	4,000	500	...	2,250	100	100	50	10,000
	33,500	42,500	8,500	1,000	16,000	3,850	1,300	50	106,700

War Secrets Spread Like a Bush Fire. Don't Gossip.

INSECT PESTS.

Notes contributed by the Entomological branch.

Insect Pests of Potatoes.

THE principal insect pests of potatoes are the potato moth (*Gnorimoschema operculella*), the vegetable weevil (*Listroderes obliquus*), and the leaf-eating ladybird beetle (*Epilachna 28-punctata*). In some seasons various species of cutworms (*Noctuidae*), and the Rutherglen bug (*Nysius vinitor*) may cause considerable damage. Other insects which attack potatoes include aphids or plant lice (*Macrosiphum solanifolii* and *Myzus persicae*), leaf-hoppers (*Jassidae*), and flea-beetles (*Halticidae*). In some areas damage may be caused by the black beetle (*Heteronychus sanctae-helenae*), and occasionally white ants (*Termitidae*) injure the tubers.

The Potato Moth.

THE potato moth is present in every potato-growing district in New South Wales.

The larvae or caterpillars may cause considerable damage to the foliage and stems in the early summer, particularly in the coastal areas, and may so injure the tops of the plants that they die prematurely, thus causing considerable loss in yield.

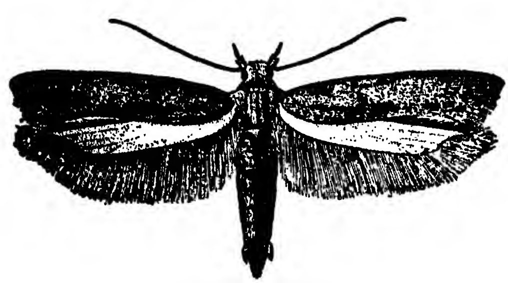
A much more serious form of injury, however, may be caused to the tubers, both while growing and during storage. Damage to the tubers in the field occurs when they become exposed, due to cracking of the soil caused by the combined effects of the expansion of the tubers, and the drying out of the soil. Loss also occurs if the tubers are allowed to remain in the field for any length of time after harvesting.

In districts where the rainfall is low, temperatures high and the ground is liable to crack, severe losses may always be expected, but in friable, self-mulching soils, and where a good rainfall is experienced little loss occurs.

Description and Life-history.

The adult moth, which measures about ½ inch across its outspread wings, is of a general brownish-grey colour, with scattered, minute, darker markings on the forewings. The moths are not readily noticeable in the fields during the day, owing to their habit of hiding amongst clods and rubbish at that time. Their protective colouration also renders them difficult to detect, but at dusk they may be seen actively flying about.

Egg-laying commences about two days after the moths emerge, and in the field the eggs are usually laid on the undersurface of the leaves. During the summer they hatch in five or six days, but during the spring and autumn the incubation period may be as long as fourteen days.



The Potato Moth. [After Graf.

The very small larva or caterpillar, on emerging from the egg, may crawl about for a while on the leaf, but soon commences to mine into the leaf tissues, causing a characteristic "blistering." As the larva grows it eats its way into the leaf-stalk, and eventually may tunnel its way into the main stem, where it generally works downwards, causing the terminal section to die. The larval stage occupies about fourteen days during the summer, but much longer during the colder months.

The fully-fed larva, which measures about ½ inch in length, has a dark-brown head and a pinkish-grey, or, if feeding in the leaves, greenish-tinged body. When fully-fed the larva leaves the plant and shelters under a clod or amongst plant refuse on the ground, and there spins a silken cocoon within which it enters its pupal or chrysalis stage.

The life-cycle, from egg to adult, occupies about four weeks during the summer, but during the colder months may be greatly prolonged. Several generations a year occur, and in the cool tableland areas, potato moths over-winter in their pupal stage within their cocoons; in the warmer coastal areas, however, activity continues throughout the winter (although greatly retarded) on "volunteer" potato plants, tubers left lying about the ground, and on weeds allied to the potato, such as nightshades (*Solanum nigrum* and *S. pterocaulon*), thorn apple or false

castor oil plant (*Datura stramonium*), and false cape gooseberry (*Nicandra physaloides*).

In the store, the eggs are laid in the eyes of the tubers, in scars or cracks, or under loose pieces of skin, and hatching occurs in four or five days in summer. The larvae usually enter the tubers through the eyes, and tunnel throughout the potatoes, filling the tunnels with excrement and permitting the entry of decay organisms; and unless checked may eventually reduce the tubers to a decaying mass. These larvae, when fully-fed, spin their cocoons in any sheltered situation, particularly where two tubers are in contact, on the sides of bags, etc. In storage, breeding may go on continuously, except in very cold weather.

Young Potato Plant showing Damage to Leaves and Stems Caused by Potato Moth Larvae.

Control Measures.

Control of the larvae feeding within the leaves is not easy, as they cannot be reached by insecticides, except during the short period between the hatching of the eggs and commencement of tunnelling. Where heavy leaf infestation occurs, the number of larvae may be greatly reduced by applying either a derris dust or derris spray, giving two or three applications with an interval of ten to fourteen days between each. The dust consists of a mixture of:—

Derris powder	1 lb.
Kaolin	7 lb.

The spray formula is as follows:—

Derris powder	2 oz.
Soap	2 oz.
Water	4 gal.

The derris-soap spray must be freshly mixed; the soap is first dissolved in the water, the derris stirred in and the spray then used immediately.

Derris is not readily obtainable at the present time.

Deep Planting and Hilling.

Deep planting is the best means of reducing tuber injury, and a depth of at least 6 inches should be aimed at, or if possible, 8 or 9 inches.

Where deep planting is not possible, the plants should be thoroughly hilled when the rhizome or lateral development has been completed and the small tubers have just started to form. Where hilling is to be undertaken, the rows should be spaced at least twenty-four to the chain, so that a wide and large hill is formed and less injury caused to the plants. The time to hill will vary with the season; hilling will be done earlier in a good growing season than in a drier one.

Soils which are deficient in humus have poor moisture-holding capacity and crack readily; thus every effort should be made to ensure a high humus content by ploughing in a leguminous green manure crop before planting.

Clean Cultivation.

The fact that the moth can over-winter on weeds allied to the potato, and on "volunteer" potato plants, etc., emphasises the importance of clean cultivation in reducing the carry-over of the pest to the next season, particularly in the warm coastal areas.

Harvesting.

The tubers should be bagged, and the bags sewn and removed from the field as soon as possible after digging, especially in warm sunny weather, as heavy infestation may occur between the time the tubers are taken out of the ground and their removal from the field.

Potato tops should never be used to cover the bags while they are standing in the field, as moths and larvae may thus be introduced into the bags.

Protection of Seed Potatoes.

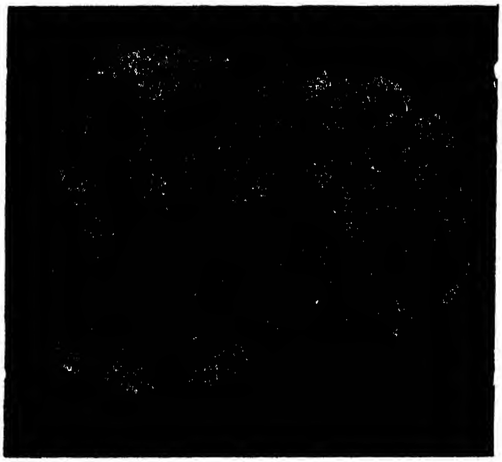
Seed potatoes may be protected from damage by the larvae during storage by dusting thoroughly with a 5 per cent. pyridine dust.

This dust, however, will not kill all the larvae which may have tunnelled into the tubers, but nevertheless it is worthwhile dusting tubers which are showing moderate infestation, as the dust prevents reinfestation and further breeding.

The dust can be applied either in the field or in the store. In the field, an easy method is to place some dust in the bottom of a tin or other container, fill the tin with tubers, place a little more dust on top of the tubers and empty into the bag, shaking the bag well down each time so as to distribute the dust. It is important that the dust covering be liberal and uniform, and to obtain this about 1 lb. of dust per bag is necessary.

In the shed, the tubers may be quickly and efficiently dusted by the following method:—

Place a sheet of corrugated iron (6 or 7 feet long by 2 or 3 feet wide) on the grading table and empty out the potatoes on to it, a bag at a time. Spread them out and sprinkle with the dust, preferably by means of some form of home-made shaker. Then roll the tubers down the sheet of iron into a receiving bag, rolling them about to ensure that the dust is well distributed. The dust collects in the corrugations and the potatoes become coated with it as they roll down. The operator can see whether the tubers have a thorough dust covering, and can vary the rate of application accordingly. After treatment the tubers should be bagged, stacked and covered, preferably with a tarpaulin, to retain the fumes.



Potato showing Internal Damage Caused by Potato Moth Larvae.

The field method of dusting may also be practised in the shed.

Usually it is not necessary for tableland growers to dust their seed between the months of May or June and October, as the cold weather acts as a natural check to moth development, but seed dug during March or April should be dusted. In coastal areas, it may be necessary to dust stored seed at any time of the year if it is infested or likely to be infested.

Pyridine dust is obtained ready prepared.

Table Potatoes.

Pyridine dust is obtainable ready prepared. table potatoes that are to be stored, but there is, however, a possibility that tainting may occur, as tests have indicated that some persons are able to detect (after the potatoes have been boiled) where the dust has been used.

Infested table potatoes may be fumigated with carbon bisulphide in an airtight container, using 2 lb. of carbon bisulphide (24 fl. oz., *i.e.*, $1\frac{1}{5}$ pint) to every 1,000 cubic feet of air space in the container (approximately ½ fluid oz. to 20 cubic feet). The gas, which is heavier than air, should be allowed to act for forty-eight hours. The liquid may be poured either into a shallow tray or on to a sack placed on top of the potatoes. The opening of the container should then be closed and any cracks sealed by pasting strips of paper over them.

Warning.

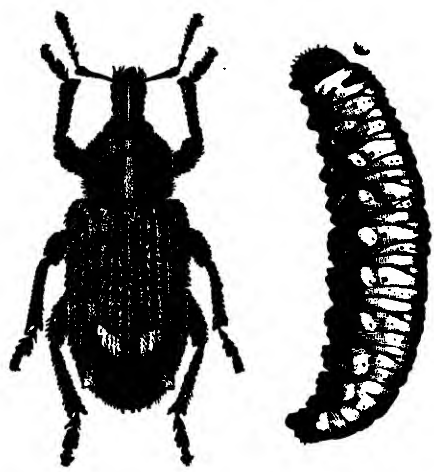
No light of any description (pipes, cigarettes, fires or embers, radiators, stoves, etc.) must be allowed in or near the sheds or buildings during the process of fumigation with carbon bisulphide. The precaution should also be taken of cutting off the electric current. Even hot steam pipes have been known to cause explosion of this gas, and the steam should be cut off and the pipes allowed to cool before proceeding with fumigation.

The Vegetable Weevil.

Both the larvae and adults of the vegetable weevil may attack the foliage and stems of the plants. They hide in the soil about the bases of the plants during the day and feed at night.

The larva, which measures about 1/3 inch in length when fully-fed, is a legless, pale-green to yellowish coloured grub. The adult weevil, which measures about 1/3 inch in length, is grey-brown and has its head produced into a snout, at the extremity of which are the jaws.

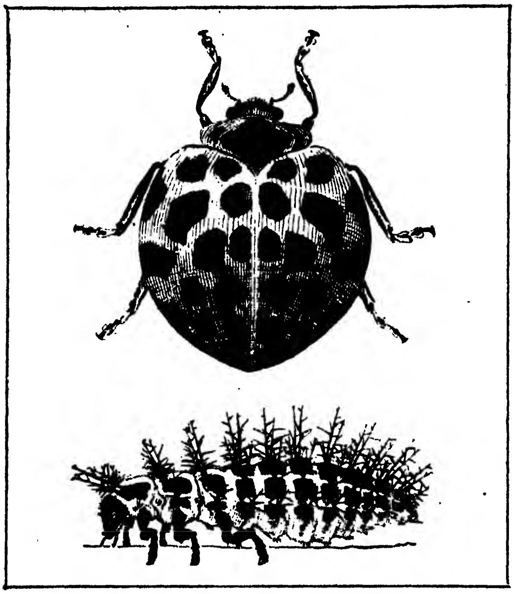
The adults, which are most numerous during October and November, remain inactive in the soil during the summer, but later, during the cooler autumn weather, they commence to lay their eggs. The larvae are only found during the colder period of the year.



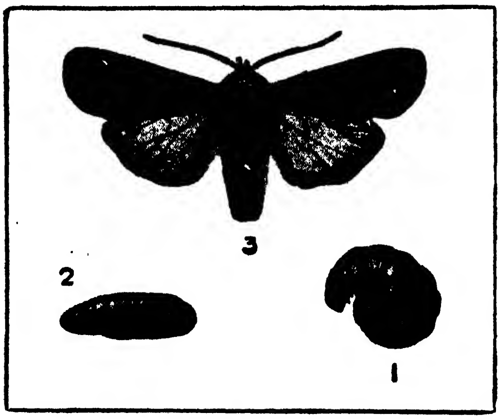
Adult and Larva of the Vegetable Weevil.

Control.

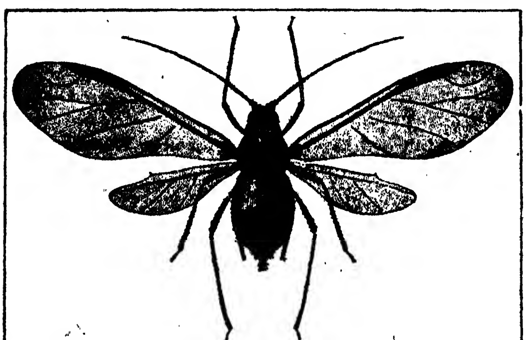
Clean cultivation is an important factor in vegetable weevil control, as this pest has a wide range of host plants including a number of weeds. All weeds, etc., therefore, should be destroyed early in the winter and the ground kept free, until planting time. The destruction of weeds late in the season may cause the weevils to migrate into cultivated areas.



Adult and Spiny Larva of the Leaf-eating Ladybird Beetle.



1. Cutworm or Larva in Characteristic Curled Attitude.
2. Pupa or Chrysalis. 3. Cutworm Moth.



A Winged Green Potato Aphid.

Ground which has been cleared should be baited with a poison bran bait before planting, or else it may be baited with chopped leaves of Capeweed, marsh mallow, waste lettuce or turnip leaves, etc., which have been either sprayed or dusted with lead arsenate.

The formula for the poisoned bran mash is as follows:—

Bran	24 lb.
Paris green	1 lb.
Salt	8 oz.
Water	2½ gal.

To prepare the bait, the bran and Paris green should be thoroughly mixed while dry, and then made into a damp, crumbly mash with the water in which the salt has been dissolved.

The bait should be broadcast over the area (at the rate of 50 lb. to the acre), before planting out, or in later infestations it may be broadcast along the rows of plants. The bait is best distributed late in the afternoon so as to remain fresh overnight. It should be remembered that the bait is poisonous and must be kept out of the reach of stock, and care should be taken in handling it.

Where the foliage of the potatoes is being attacked control can be obtained by spraying or dusting with lead arsenate.

The Spray.

Lead arsenate powder	4 oz.
Water	5 gal.

The Dust.

Lead arsenate powder	1 lb.
Kaolin	4 lb.

The Leaf-eating Ladybird.

THE adults and larvae of this beetle feed on the upper surfaces of the leaves and cause them to become skeletonised and withered. They also feed on many other plants in addition to the potato.

The adult ladybird is orange-yellow, and closely spotted with twenty-eight, irregular black markings. Its injurious larvae are readily distinguished from the other beneficial ladybird grubs, as they are covered with numbers of black, branching spines.

Control.

Control of this pest may be obtained by dusting the foliage with a mixture of:—

Arsenate of lead powder	1 lb.
Kaolin	4 lb.

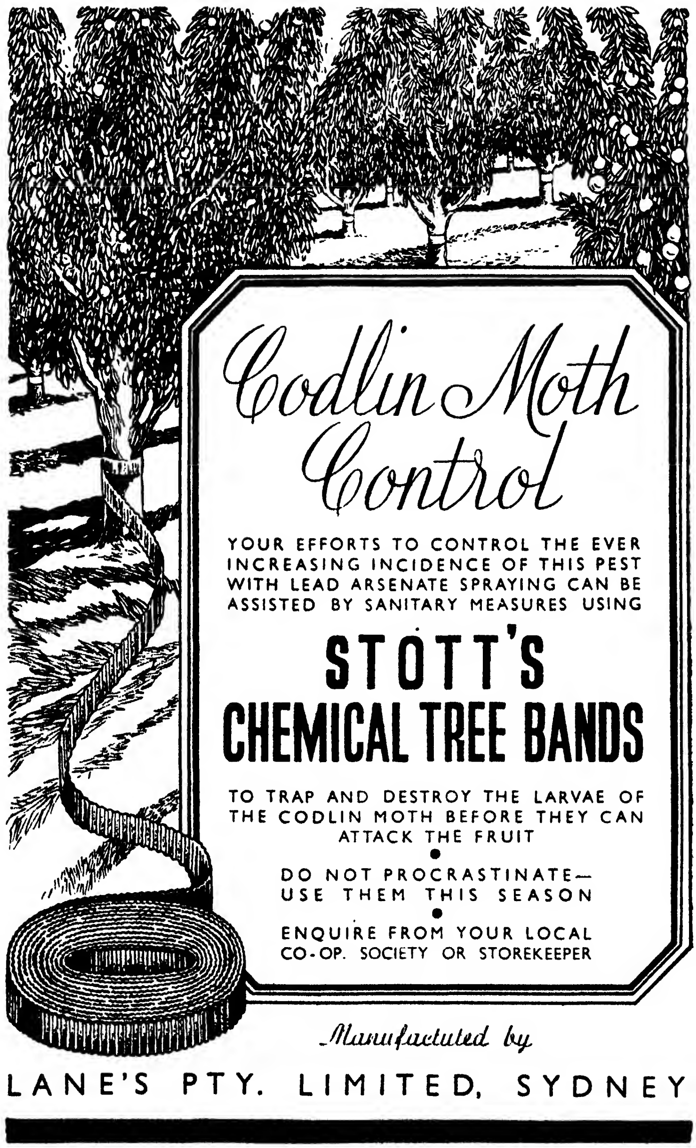
or by spraying with arsenate of lead at the rate of:—

Arsenate of lead powder	4 oz.
Water	5 gal.

A second application of dust or spray about ten days after the first may be necessary.

Cutworms.

CUTWORMS are the larvae or caterpillars of several species of moths. They are usually dull-coloured insects, which mostly feed at night, and hide in the soil during the day. They may measure up to about 1¼ inches in length when fully-fed.


Codlin Moth Control
YOUR EFFORTS TO CONTROL THE EVER INCREASING INCIDENCE OF THIS PEST WITH LEAD ARSENATE SPRAYING CAN BE ASSISTED BY SANITARY MEASURES USING
STOTT'S
CHEMICAL TREE BANDS
TO TRAP AND DESTROY THE LARVAE OF THE CODLIN MOTH BEFORE THEY CAN ATTACK THE FRUIT
DO NOT PROCRASTINATE— USE THEM THIS SEASON
ENQUIRE FROM YOUR LOCAL CO-OP. SOCIETY OR STOREKEEPER
Manufactured by
LANE'S PTY. LIMITED, SYDNEY

Control.

These caterpillars feed on a great variety of weeds and grasses, in addition to cultivated crops, and therefore, any ground that has been cleared should be baited after an interval of several days, with a poison bran mash as recommended above for the vegetable weevil, before planting out, or else the bait may be broadcast along the rows of plants in later infestations.

Rutherglen Bug.

IN some seasons, Rutherglen bugs may occur in vast swarms, and become serious pests during mid-summer. Infestations frequently occur during dry warm weather when the water content of the soil is low, and the plant roots are unable to obtain sufficient moisture to replace that which is lost in the form of sap. The younger growth of the terminal shoots of the plants is first attacked, and the effect of great numbers of these small bugs sucking the sap causes drooping and wilting of the foliage, and in some instances destruction of the plants.

The adult winged bugs, which measure about 1/5 inch in length, are narrow-bodied and greyish-yellow in colour. They crawl actively about, but fly quickly when disturbed, their movements suggesting those of small flies.

Control.

As the bugs breed amongst various weeds and grasses, clean cultivation is an important factor in their control.

It is impossible to prevent the active, adult winged bugs from entering crops, except perhaps by means of a smoke screen from a smudge fire.

In crops such as potatoes, the numbers of bugs may be considerably reduced by brushing them into a shallow trough drawn through the rows. Water and oil, or thin tar, is poured into the bottom of the trough, which should be about 6 feet long and about 2 feet wide, and as it is drawn through the rows, an operator following behind brushes the bugs into it by sweeping the plants with a small leafy branch of a tree or bundle of brush. This procedure should be followed on several consecutive days.

A method sometimes adopted where severe infestations occur, to prevent immature bugs from crawling into cultivated areas, is to construct a furrow with the vertical side nearest the crop. The bugs crawl or fall into the furrow, and if holes about 1 foot in depth are dug in the bottom, at intervals of about 15 feet, the bugs collect in them and may be readily destroyed by spraying with a crude oil, or other oil, emulsion. Many of the winged bugs may also be trapped in the furrow.

Another method of deterring the bugs when they are crawling into cultivated areas, is to spray a band of crude creosote oil or wood-preserving oil or thin tar, along the ground on the edge of the area.

A 2½ per cent. nicotine dust or a mixture of hydrated lime 1 lb., and fine tobacco dust 1 lb., may be applied to the plants to act as temporary deterrents.

Control may be obtained by spraying with a kerosene-pyrethrum emulsion, but pyrethrum is not obtainable at present.

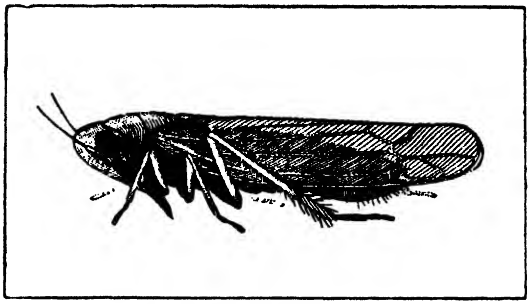
Potato Aphids.

APHIDS feed by sucking the sap, and where they become abundant, may cause considerable damage, particularly if the weather is dry.

These insects may be controlled by spraying with nicotine sulphate in a (1:1:10) Bordeaux mixture, at the rate of 16 fluid ozs. of nicotine sulphate to 40 gallons of mixture. Where the infestation is severe, a further application after an interval of a week may be necessary. Particular attention should be given to the undersurface of the leaves.

Leaf-hoppers.

LEAF-HOPPERS are small, yellowish-green insects which feed by sucking the sap. The adults jump and fly readily when disturbed. The treatment recommended for aphids will control them, and copper sprays applied to control potato diseases will also check them.



An Adult Leaf-hopper.

Flea-beetles.

THE flea-beetles constitute a group of (mostly) very small species of plant-eating beetles, in which the femora or thighs of the hind legs are thickened, so that the beetles are able to jump in a manner similar to fleas. They gnaw small irregular holes in the leaves, and at times may occur in considerable numbers.

Control.

A lead arsenate dust as recommended above for the control of the vegetable weevil, 20 per cent. calcium arsenate dust, or a lead arsenate spray used at the rate of lead arsenate powder 2 lb., water 40 gal. (2 oz. to 2½ gal.), will control them.

The Black Beetle.

THIS scarab beetle is a pest in the coastal areas, and its numbers fluctuate greatly from year to year. It is apparent that its larvae, which are "white curl grubs" in the soil, are unable to withstand very wet conditions, and as a result the

beetles always occur in much larger numbers following upon a spring and early summer in which the rainfall has been much below normal.

The main damage is caused by the adults, and there are two periods when injury occurs, namely, the spring and, to a lesser extent, the autumn.

The adult, which is a glossy-black beetle, measures about ½ inch in length and has the

The Black Beetle.

front legs modified for burrowing into the ground. The beetles are of nocturnal habits and shelter in the ground during the day.

The adults overwinter in the soil, and during October and November, in particular, they frequently swarm in the early evening and invade crops. The second generation of beetles also swarms periodically in the autumn and invades crops, and later these beetles make their way beneath the ground to overwinter.

In addition to a wide variety of host plants, potato tubers are commonly attacked, the beetles burrowing within and frequently leaving only a hollow outer covering.

Control.

There is no ready means of controlling this pest in many crops. The beetles fly readily and crop infestation is usually due to invasion by flying swarms. In some instances, however, the beetles have been observed to crawl from adjacent paspalum land, and where this occurs, some protection of the crop may be obtained by constructing a deep vertical-sided furrow along the edges of the crop as recommended above for the Rutherglen bug.

Recently turned paspalum land is especially attractive to the beetles.

White Ants.

IN certain areas, white ants occasionally cause some damage to the tubers, during dry seasons, by tunnelling into them.

There is, however, no ready method of treating the soil to prevent such occasional attacks. When clearing land, therefore, care should be exercised to remove all stumps and roots from the ground and any white ant nests in the vicinity should also be destroyed, as white ants may travel considerable distances underground from their nests to reach suitable food supplies.

Care of Cream in Transit.

WITH the approach of hot weather and spring growth of pastures and herbage, every care must be taken in the production of cream for butter making. Butter factory graders will be called upon to exercise special care in the grading of all creams, because sound quality butter is essential for the export trade under present conditions of transport, and on account of our commitments to Britain an increasing proportion of our butter will be exported. In times past much cream was received which was classified as only "bare choicest," and this was used for the local trade, now reduced by butter rationing. Butter made from this cream was not stored for any great length of time, and the quality was therefore not affected.

Strict attention should be given by the farmer to the various measures calculated to maintain cream quality, from the time the milk leaves the cow until it reaches the factory. With regard to transit, the following suggestions are made:—

1. Have the cream at the roadside by the time the carrier calls, and do not keep him waiting.

2. If cream is left at the roadside, have a properly constructed stand built, so that the cream is protected from the sun. This stand should be constructed so that the carrier can load the cream on to his lorry without any undue lifting.

3. Do not have the cream in this stand too long. Leave your cream in the dairy as long as possible.—J. W. G. SMITH, Senior Dairy Instructor.

The Harvesting and Threshing of Cucurbit Seed.

(*Continued from page* 500.)

cucumbers and rockmelons, enabling the seed to be dried in the field immediately after threshing and washing. In the drying of cucumber and rockmelon seed, it is important that the operation be done rapidly and preferably in the shade, as the sunshine blanches the seed.

The old method of handling the threshed seed and juice was to ferment the mass in large tanks, dams or barrels. Mr. Hutton, of the Council for Scientific and Industrial Research, Canberra, has worked out an economical chemical method of cleaning cucumber seed, which should be suitable for other cucurbits.

Examining the Work of a Young Queen Bee.

Apiary Notes.

W. A. GOODACRE, Senior Apiary Instructor.

The Characteristics of Various Races of Bees.

IT is interesting to study the characteristics of the various races of honey bees. We find that, as with the people of different countries, they vary a great deal both in colour and temperament. Since the early importations of the old black bees from England, from which the bee-farming industry was established in Australia, a number of importations of Italian, Carniolan and Cyprian varieties have been made. Of these varieties the Italian strain has played the most prominent part in building up and improving the breeding of bees suitable to conditions obtaining in this country, and still remains in favour with the majority of commercial bee-farmers. Next in demand to the Italian strain is the Carniolan, and these two breeds along with crossbred and hybrids, are predominant. Commercial breeders of bees now specialise in raising them, and other varieties are practically unobtainable.

The Italian Bee.

Earlier importations of Italian bees were of the Ligurian (leather-coloured) type, and by selection a very hardy strain was evolved in this country. They gave excellent results in honey-gathering, and were disease-resistant and non-swarming in habit. The Ligurians hold steadily on their combs during manipulation of the hive, and they can be comfortably controlled by the usual methods employed.

The old Ligurian type would be somewhat of a disappointment to many of our present-day bee-farmers because of its colour. The third yellow band on the abdomen of the worker was very obscure, and gave the impression, wrongly, of course, that the strain was not pure. Although with the queens a rather wide variation of colour was shown, the workers were uniform in their markings, the under portion of their abdomen being quite dark. This dark colour under the abdomen is a useful point in the identification of the true Ligurian. Here and there traces of the old strain of leather-coloured bees are seen, but generally the type is fast disappearing in Australia, although some of its inherent good qualities remain.

Bright-banded Italian.

Importations of bees from Italy during recent years are of a type showing a much brighter apearance. The three yellow bands on the abdomen of the workers, characteristic of the Italian variety, are prominently displayed, and there is a tendency in some cases towards a fourth band. It is considered, in view of this, that they should be classed as "bright-banded Italians" to distinguish them from the Ligurian and Golden types.

The queens vary in colour, but not so greatly as in the case of the Ligurian, and their size is quite up to the standard of the average selected Italian strain built up under local conditions.

These bees are quiet on the combs and gentle during manipulation. Ample proof is available of their satisfactory honey gathering qualifications, and they are pleasing in other respects. The strain has proved to be eminently suitable under Australian conditions.

The Golden Italian.

The Golden Italian has been built up principally from bright-banded bees by selection for colour, and it is distinguished by having four to five segments of the bodies of the workers a full golden colour.

Selection for colour does not appear to be the best course to pursue in building up a virile strain of bees, but where proper care has been exercised in selection where "Goldens" have been established, they have given very good results.

The beautiful colouring of the golden bees has a special appeal to many, and the hobbyist bee-farmer is particularly keen on them. Where the bee-farmer is operating crossbred and hybrid types with a preponderance of the old Black bees, the Golden is particularly useful in raising the colour standard, but those working a good strain of bright Italian should not endeavour to produce more colour by introduction of Golden types.

The Carniolan Bees.

The Carniolan bees are raised in a cold alpine climate in their native land. They are about the same size as our larger Italians. the queens being dark in colour, and on some occasions show a tendency for an Italian band or two on the upper segments of the abdomen. Since the queens are raised fairly close to Italy, it is quite reasonable to believe that in making up this variety, perhaps centuries ago, some Italian blood was introduced. The workers are dark and uniform in colour, and they show prominent silvery lines across each segment of the abdomen. If held by the wings, the bee will bend the abdomen downward, and it will be seen that the silvery colour extends to a fair width under each segment. The more the bee is distended, say, during a honey flow, the more prominent these typical lines become. Except for the lines on the abdomen, the bees are very similar to the old Black bees.

Kept in small hives in their native land for many years, perhaps centuries, the swarming tendency has been developed in the Carniolan, and the pure variety is troublesome in this direction. A good number of queens have been raised by the Department from the imported ones and crossed with the Italian, and it was found that in this Carniolan x Italian the tendency towards swarming is considerably reduced. The first cross in this case shows up well in general qualifications, but the problem of maintaining a first cross in an apiary is one which could hardly be worked on an economic basis.

It is considered that the cross between the Carniolan and Italian is superior generally to the cross between the Blacks and Italian, but it is not recommended that anyone working an apiary of pure Italian, or those looking forward to that standard, should change over to any cross by the introduction of the Carniolan variety.

A number of bee-farmers, including a few prominent in the industry, have introduced Carniolans into their apiaries and speak well of them, but the Department in a series of observations and experiments has not found the variety to be up to the level of our Italian strains in general qualifications. It is admitted that the Carniolans are good honey gatherers when they hold together in the hive, and are easy to control; but with us they swarmed too much, and the queen bees, unless branded with a bright disc attachment, were very difficult to find in the hive.

The Cyprian Bee.

The Cyprian is very similar in colour to the three-banded Italian, and slightly smaller. The queens are very prolific, and raise large numbers of queen cells. Rather more propolis is fastened about the hive than is

desirable. Cyprians have fairly good honey-gathering qualities, but the temperament of this variety is its most serious drawback. The workers are "fussy" on the combs during manipulation, and it is rather difficult to locate the queen on account of the excitement. During the autumn, when the bees are excitable, the use of smoke as a control measure is of little avail, as the bees simply dance about the top of the frames fanning the smoke away with their wings, and are quite prepared to start stinging when the smoker is put down to allow operations to commence. The "fussy" characteristic is well maintained in the various crosses from this variety tried by the Department.

Following the Department's experience with the Cyprian strain, the bee-keeper should not attempt even a trial introduction.

SELECTION FOR BREED IMPROVEMENT.

One of the most important aspects of the work of the apiarist is the improvement of his bees by selection of breeding stock.

It is possible, by selection in breeding, to improve the average honey production per colony, lessen swarming tendency, obtain bees that can be worked with comfort, and minimise risk of disease in the apiary. The beekeeper should be a keen observer, and test out as breeders those stocks showing special qualifications.

The queen bee, since she is the one responsible for the breeding in the hive, should have good development; the small type or those with a narrow body are not recommended as breeding queens. The sealed brood of the queen should be nicely packed, for this indicates that her egg-laying work has been carried out methodically.

Honey-gathering Ability.

Every commercial beekeeper has noticed from time to time a number of colonies which fill a super or two of honey more than the average ones, and it is amongst these that he should look for breeders. There is usually room in the apiary for the placing of young selected queen bees. Many of our best beekeepers make a practice of re-queening 50 per cent. of their average producing colonies every season, and others believe that it would pay to re-queen all of them every year.

Swarming Reduced by Selection.

A queen bee selected as a breeder should have established a populous colony which has held together for honey production without exhibiting a tendency to swarming. Generally we find that the specially active honey-gathering colonies have the non-swarming qualification desired. It is found, too, that by the selection of breeding stock from bees not inclined to swarming, the natural desire for increase, which is to a great extent an hereditary one, is considerably lessened.

Breed Bees Easy to Control.

Much can be done by selection in breeding to produce a good and even-tempered strain. Every beekeeper desires to have bees that can be easily controlled, and we find that the reasonably quiet bees, which are steady on the combs during manipulation, usually show up well as to general qualifications. The fussy bees, that run about the combs and make things uncomfortable for the beekeeper by excessive stinging, should not be considered for breeding purposes, even though they show, in odd cases, some other good points. Apart from uncomfortable working, it is difficult to find the queen in a fussy colony, and the presence of the flying bees about other hives stirs up the more docile bees.

Select for Stamina.

By selection in breeding a great deal can also be done to improve stamina and disease resistance, a fact of much importance where adverse conditions such as droughts, have to be encountered; and in practically every bee disease that we know of, the stamina or disease resistance of the strain plays a most important part.

Where dwindling troubles, such as Nosema disease or paralysis of bees, are present, it is invariably recommended that, in addition to stimulating the colonies with sugar syrup, a fresh queen raised from vigorous and resistant stock be introduced, and it rarely fails to produce results. In European foul brood (*Bacillus pluton*) the best preventive or cure is to re-queen with stock from a vigorous Italian strain. Although this is a bacterial disease, these hardy bees are able to clean up the infection in the brood and brood combs.

In the case of American foul brood (*Bacillus larvae*) it is found that bees cannot clean up an infected hive, but from recent observations and experiments it is apparent that certain vigorous stocks are more resistant than others. A colony with an inherent or, in fact, any weakness may become infected with a comparatively small number of the bacilli, whereas others of selected breed would withstand a greater number. In the writer's experience with the disease, it has been noticed that in an apiary where heavy infection is present, a number of vigorous colonies are usually quite clean. The bees in these hives have no doubt been as exposed to infection as the others, and it seems reasonable to believe that the immunity of a colony is due to its greater resistance, the larvae being well fed and full of vitality.

Fresh Butter for the Troops—Tropical Butter-fat Spread.

As the outcome of the research work done by Dr. Wiley, of the Council for Scientific and Industrial Research, and his staff, in co-operation with Mr. Loftus Hills and the Queensland Butter Board, Allied troops in the tropics are now being supplied with a new product called "Tropical Butterfat Spread," which has a higher food value than commercial butter, instead of the tinned butter they previously received and which has not the quality of fresh butter. In hot climates where cool storage is not available, tinned butter tends to become liquid and to exhibit varying degrees of rancidity.

Freshness Retained.

The new product is a butter than can be spread with a knife instead of being applied in a semi-liquid form, and, moreover, retains its freshness. The improved keeping quality and consistency have been largely obtained by the exclusion of water and air in the process of manufacture.

Tropical butterfat spread is manufactured from pure creamery butter. This is melted with live steam, and the melted butter is run into large neutralising and mixing vats. After neutralisation has taken place the melted butter is run through high-speed centrifuges, where the pure, dry butter fat is separated from the water, salt and curd. The pure fat is then boiled under vacuum and partly cooled before being run into a mixing vat. To the pure butterfat is added a small quantity of finely powdered salt, skim milk powder, diacetyl flavouring and 19 per cent. of hydrogenated butterfat which increases the melting point of the product to about 105 deg. Fahr.

After thorough mixing of the ingredients the spread is de-aerated in a vacuum chamber and shock cooled under vacuum before it is packed into 1 lb. or 5 lb. cans. These cans are sealed under vacuum to exclude any air from the container.

High Melting Point.

The spread will not melt at a temperature below about 105 deg. Fahr. Even if higher temperatures are encountered and the product should melt, thus causing the salt and skim milk powder to settle out, these ingredients can easily be re-incorporated by stirring. If kept at a temperature below 100 deg., palatability is better maintained.

When opened the tins should be protected from light, air and water, but holding after opening is not recommended. Fat expands when hot and contracts when cold. Expansion may cause the tins to bulge, but they should return to their normal shape when stored in a cool place for some hours.

The exclusion of water from the compound effectually prevents rancidity. As ordinary butter contains 16 per cent. of water, tropical butterfat spread has a higher food value than the commercial article.

Post-war Possibilities.

Before the war considerable quantities of tinned butter were sent to tropical countries. There is good ground for the belief, therefore, that when the war is over a greatly improved article will create a wide demand. In the meantime Allied soldiers are enjoying the change which the butterfat spread has made possible in their diet.

The working out of the process adds another item to the long list of important discoveries that Australian scientists have made under the stimulus of war. Apart from the centrifuges, the whole of the plant and machinery for the equipping of the factory in which tropical butterfat spread is being turned out was made in Australia.—*Department of Information Statement.*

Sowing of Cauliflower Varieties.

ALTHOUGH cauliflowers are normally a cold climate crop, modern plant selection work and the adoption of suitable cultural techniques have enabled growers to produce crops almost to perfection in every district of the State. The following are the most suitable times to sow the different cauliflower varieties:—

TABLELAND AND WESTERN DISTRICTS.

October-November. — Nugget, White Queen, Early Erfurt, Early Snow White.

December.—Nugget, Hawkesbury Solid White, Five Months Special Giant, Late Phenomenal.

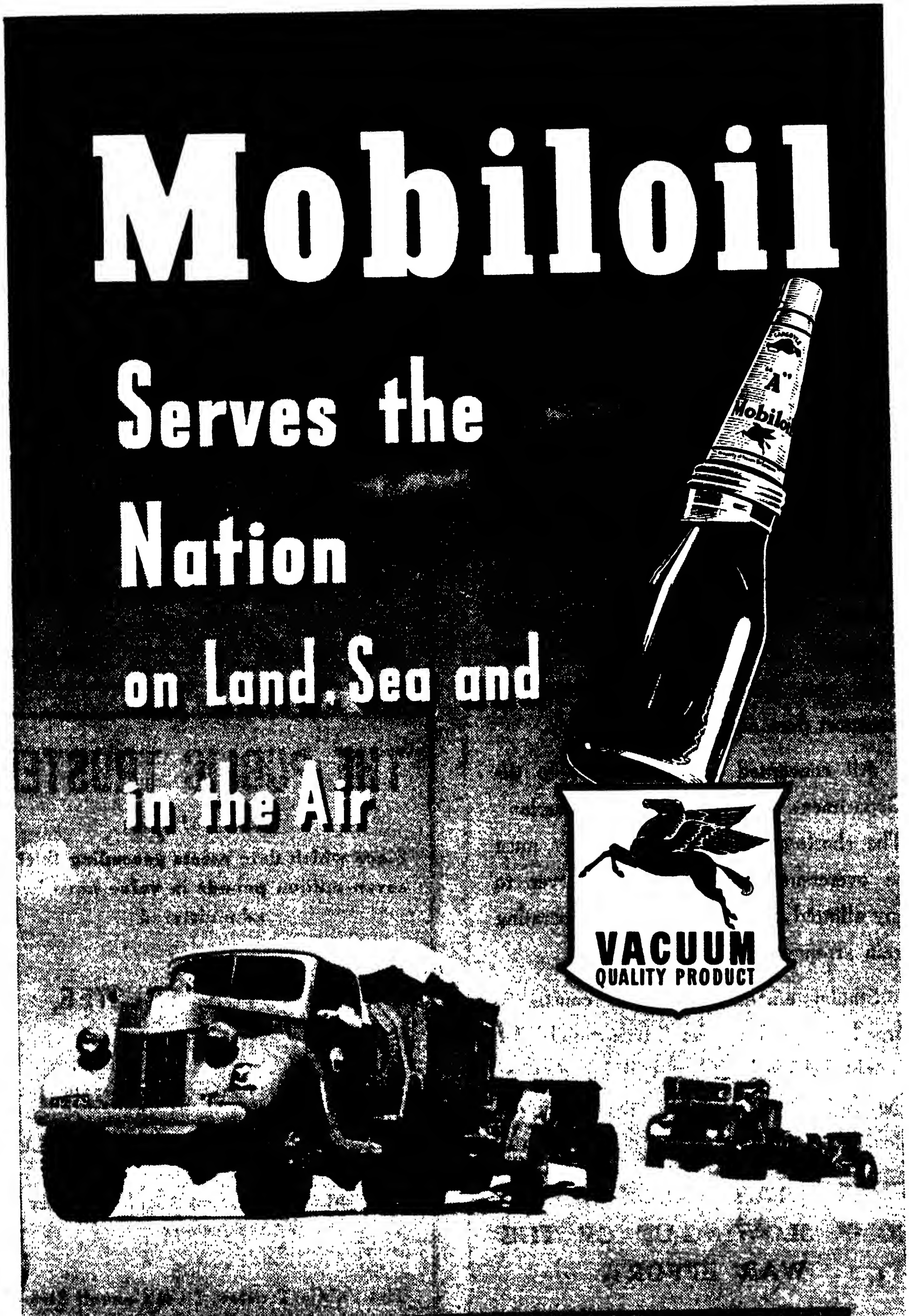
January (*Early*).—Late Phenomenal.

COASTAL DISTRICTS.

November,—Nugget, Early Solid White.

December.—Nugget, Five Months Special Giant, Early Solid White, Short's.

January.—Six Months Special Giant, Late Phenomenal, Short's.


Mobiloil
Serves the
Nation
on Land, Sea and
in the Air
"A"
Mobiloil
VACUUM
QUALITY PRODUCT

RAILWAY TRUCKS MUST BE KEPT MOVING.

THE imperative need for the quick release of goods trucks and wagons, stressed so often in this column, is again emphasised by the Commissioner for Railways, Mr. T. J. Hartigan.

The Department of Railways has been planning and working with that object in view ever since war needs made such insistent calls on its rolling stock for the movement of Defence equipment, whilst there was little, if any, lessening of transport demands for civilian needs.

All concerned are asked to help the Department. The urgency is serious. The shortage of carrying capacity must be overcome. Any delay whatever to any allotted trucks dislocates the operating train arrangements.

Station officials are being constantly urged to speed up the "turn-round" of freight vehicles. They will be glad of the full co-operation of the public in doing so.

EVERY IDLE TRUCK MEANS SOME SLOWING-UP OF THE WAR EFFORT.

S. R. NICHOLAS,
Secretary for Railways.

INTERNAL PARASITES OF HORSES.

Methods of Treatment.

G. L. McCLYMONT, B.V.Sc., Veterinary Officer.

INFESTATION with internal parasites, or "worms," is frequently the cause of many of the common troubles encountered with horses—such as unthriftiness, loss of condition, harsh coats, rapid tiring on working, and digestive disturbances—so that the maintenance of the animals as free as possible from these parasites is necessary for good health.

Prevention of infestation is the logical method of avoiding disease due to parasites, but where infestation has occurred, treatment with drugs is necessary. Most drugs are given either as drenches, by capsule, by stomach tube or as powders in the feed.

Precautions Necessary in Treatment.

As faulty administration of drugs with entry of them into the wind-pipe may have fatal consequences, the administration of drugs such as carbon disulphide, which must be given by capsule or stomach tube, should be left to a veterinarian. Treatment by drenching is the most practicable method for the average horse-owner, but even in drenching extreme care must be taken to avoid entry of drugs into the wind-pipe and attention should be given to the following points:—

(*a*) Never drench while a horse is struggling;

(*b*) Never have the horse's head too high—an approximately horizontal position is the best.

(*c*) Give the drench slowly, being careful to see that each mouthful is swallowed before the mouth is filled again.

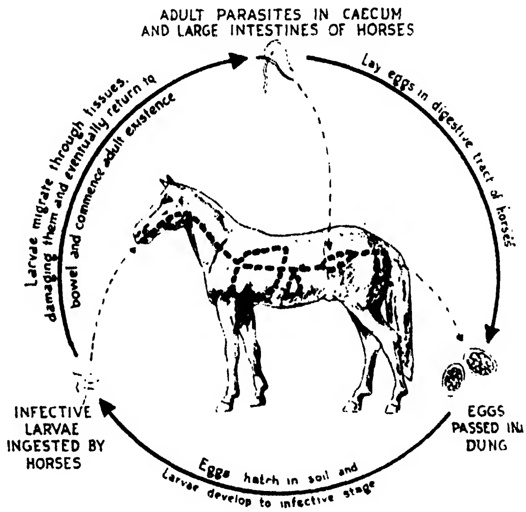
(*d*) Never attempt to assist swallowing by squeezing the throat or covering the nostrils.

Most drugs, if given in excessive amounts or under certain conditions, may be toxic for horses, so that the following additional precautions should be taken:—

(*a*) Always work out the dose carefully before drenching;

(*b*) Horses suffering from constipation or colic, or any condition causing a rise in temperature, should not on any account be treated.

(*c*) With highly bred horses, it may be advisable to reduce the dose rate of oil of chenopodium by 20 per cent. Pregnant mares should not be treated with this drug.



Life History of the Red Worms.
[*Adapted from Illinois College of Agriculture Circular* 496.]

(*d*) Treatment of parasites in the stomach and small intestine should be preceded by at least 18-24 hours starvation, and treatment of parasites in the large intestine by 36 hours starvation. With horses in poor condition, these periods may have to be somewhat reduced. These starvation periods are necessary to rid the digestive tract of much of the food matter contained in it, and to allow the drugs to pass through the tract quickly.

Common Drugs and Their Use.

The main points about the drugs commonly used for the treatment of internal parasites of horses, are as follows:—

Drug.	Dose.	Method of Administration.	Use.
Carbon tetrachloride ...	30 c.c. (1 oz.) for ponies; 60 c.c. (2 oz.) for hacks and draughts; 75 c.c. (2½ oz.) for heavy draughts. Doses based on 5 c.c. per 100 lb. live weight.	As a drench in 1 to 2 pints of paraffin oil.	Very effective against red worm. Fairly effective against round worms and bot-fly larvæ.
Oil of chenopodium ...	10 c.c. (⅓ oz.) for ponies; 20 c.c. (⅔ oz.) for hacks and draughts. Doses based on 2 c.c. per 100 lb. live weight.	As a drench in 1 to 2 pints of linseed oil. If no bowel movement in 24 hours, more linseed oil may be given.	Very effective against red worm. Fairly effective against pin worms.
Oil of turpentine (not "Mineral Turps").	30 c.c. (1 oz.) for ponies; 60 c.c. (2 oz.) for hacks and draughts. Doses based on 5 c.c. per 100 lb. live weight.	As a drench in 1 to 2 pints of linseed oil.	Fairly effective against red worms.
Carbon bisulphide ...	10 c.c. (⅓ oz.) for ponies; 20 c.c. (⅔ oz.) for hacks and draughts; 25 c.c. (⅚ oz.) for heavy draughts. Doses based on 2 c.c. per 100 lb. live weight.	By capsule or by stomach tube. Unless experienced in this practice, administration of this drug is best left to a veterinarian.	Very effective against round worms, botfly larvæ, and stomach worms.
Phenothiazine	20 grams (⅔ oz.) for ponies; 30 grams (1 oz.) for hacks and draughts.	As a powder in the feed, followed 6 hours later by warm bran mashes. (*Warning.*—This drug may, at times, be very toxic. See under Red worms.)	The most effective drug against red worms. Variable effect against round worms.

Common Parasites and Their Treatment.

The commonest parasites of horses in Australia are the red worms (*Strongylus, Trichomena* and *Triodontophorus* sp.), round worms (*Ascaris equorum*), pin worms (*Oxyuris equi*), stomach worms (*Habronema* sp.), tapeworms (*Anoplocephala* and *Paranoplocephala* sp.) and the larval stage of the bot fly (*Gastrophilus* sp.).

Red Worms.

These worms are from ½ inch to 2 inches in length, round, up to ⅛ inch in diameter, white or red in colour, and they are found in the large intestine attached to the mucous membrane or lying free in the bowel.

Eggs laid in the bowel pass out in the dung and hatch out into larvae. These larvae remain alive longest in moist, cool areas, so that the greatest number of larvae are picked up by horses grazing over damp, low-lying areas. On being taken in with the food, the larvae pass into the wall of the large intestine and, according largely to the species to which they belong, either spend some time in the wall of the intestine, producing small nodules which may interfere with the action of the bowel, pass through the lungs, or migrate into the walls of arteries supplying the intestine. They may partially block these arteries, this being a common cause of digestive troubles such as colic and more serious complaints such as gangrenous enteritis and intussusception which frequently end in death of the animal. Eventually, after spending up to several months in these locations, the larvae migrate back to the bowel and commence their adult existence.

Symptoms.—Some of these worms are blood suckers, so that anaemia (evidenced by pale eye membranes), poor appetite, stunted growth, loss of condition, harsh coat, rapid tiring on working and digestive

troubles, such as recurrent colic and scouring, are common symptoms. In heavy infestations swelling of the legs may develop and death may result. Horses of all ages may be affected, but young horses, old horses with poor teeth, and horses with insufficient feed are the most likely to be affected.

Diagnosis.—Diagnosis of infestation with red worms can usually be made on the above symptoms and on the finding of adult worms in the dung. Microscopic examination for worm eggs in samples of dung, as carried out by a veterinarian, enables a rapid and certain diagnosis.

Treatment.—Several drugs—carbon tetrachloride, oil of chenopodium, oil of turpentine and phenothiazine—may be used for the treatment of these parasites. Details of the methods of administration of the first three drugs are given in the accompanying table.

Phenothiazine, while probably the most effective and easily administered drug, results, at times, in unaccountable mortalities. While the risk is small, risk there undoubtedly is, and unless the owner is prepared to accept the small chance of losing horses, phenothiazine should not be used. If it is used, it should be given in a bran mash after 24 hours starvation and followed, after 6 hours, by further warm bran mashes. Horses in an anaemic condition or suffering from any illness should not be treated with phenothiazine.

Prevention.—Moist grazing areas, overstocking, and under-feeding should be avoided. Teeth should be regularly examined and treated. Rotational grazing, burning-off old pasturage, and foaling and weaning in spelled paddocks are further measures which help to reduce the infestation of pastures with the worm larvae, and decrease the number of larvae taken in by horses during grazing. When stall feeding, care should be taken to avoid contamination of feed with manure.

Round Worms.

These worms may be from 6 inches to over 1 foot in length, and over ¼ inch in diameter; they are found lying free in the small intestine. The eggs of this worm do not hatch on the ground, but are picked up by grazing horses, the larvae then hatching out in the intestine and migrating through the lungs of the horse before finally returning to the intestine to commence their adult existence.

Symptoms.—Foals suffer most acutely from this parasite. In heavy infestations there may be a rise in temperature and coughing due to pneumonia caused by the larvae passing through the lungs. Later, as the effects of the adult worm become noticeable, unthriftiness, stunted growth, loss of condition, scouring, harsh coat, rapid tiring and digestive trouble will result.

Diognosis.—Diagnosis can usually be made from the above symptoms in young foals, and finding of adult worms in the dung. Microscopic examination of dung samples by a veterinarian will detect the eggs.

Redworms (*Strongylus* sp.).
[*After Roberts.*

Treatment.—Carbon tetrachloride, given as for red worms, is a fairly effective treatment for these worms. Carbon disulphide is the most effective treatment, but this drug must be given in a capsule or by stomach tube.

Prevention.—Treatment of mares for round worms before foaling, foaling in spelled paddocks, rotational grazing and weaning into further spelled paddocks, are the measures which should be adopted to prevent round worm infestation of foals.

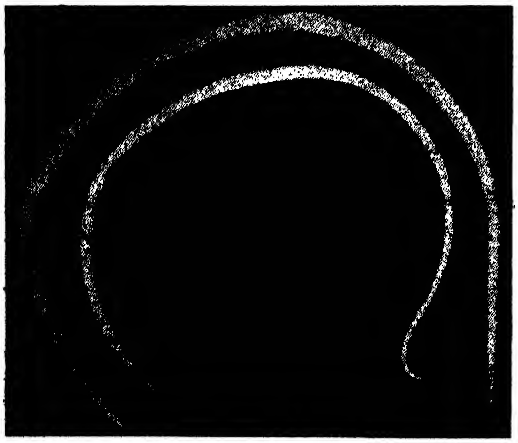
Pin Worms.

These worms, the male of which is about ½ inch in length and the female up to about 6 inches, are found in the large colon and

blind gut. The adult females lay their eggs by migrating to the anus and depositing the eggs on the surrounding skin. The eggs develop into infective larvae and fall from this site in about three days.

Symptoms.—The only noticeable effect of these worms is the restlessness and tail rubbing caused by the irritation of the females laying their eggs. A bare area may be worn at the base of the tail from this rubbing.

Diagnosis.—Diagnosis may be made from the above symptoms but, as tail rubbing may be due to other causes, the skin about the anus should be examined for the cream coloured egg masses. These should be examined microscopically to confirm the diagnosis.



The Round Worm.
(Two-thirds natural size:)
[*Illinois College of Agriculture Circular* 496.

Treatment.—Oil of chenopodium is fairly effective, and copious enemata of saline or infusions of quassia are also fairly effective treatments. White mercuric ointment or carbolic ointment applied to the skin about the anus will help to relieve the irritation and kill the eggs.

Prevention.—Treatment of horses to remove the adult worms, and avoidance of overstocking and contamination of feed with manure, are the measures which should be adopted in controlling this parasite.

Stomach Worms.

These worms, which measure up to ¾ inch in length, are found, depending on the species, either in masses of mucous on the stomach wall, or embedded in fibrous growths which protrude into the stomach. The life cycle of these worms is somewhat complicated. The larvae in the dung are picked up by stable and house flies and undergo development in these flies, horses being reinfested by swallowing the flies in their food or water or by the larvae migrating from the flies as they feed about the mouths of horses. Some forms of conjunctivitis are due to larvae being deposited in the eyes by flies, and some types of skin growths are also caused by these larvae.

Symptoms.—In spite of the large fibrous stomach tumours which may be produced by one species of these worms, symptoms of infestation directly traceable to these worms are rarely noted; however, some digestive disturbances and much of the common unthriftiness among horses may be caused by them.

Treatment.—Treatment involves first washing out the stomach with 2 per cent. bicarbonate of soda by stomach tube to remove the mucous surrounding the worms, and then administration of carbon disulphide, 2 c.c. per 100 lb., by means of a capsule or stomach tube. This treatment should only be carried out by a veterinarian. Worms in the fibrous tissue masses cannot be treated.

Prevention.—Infestation may be prevented by hygienic disposal of manure away from flies, such as in fly-proof pits, control of flies about the stable by traps and elimination of all possible breeding grounds, and by prevention of contamination of food and water by flies.

Bots.

Bots are not true worms, but the larvae of bot flies which measure up to ¾ inch in length, and are brown in colour and covered with small hairs. The flies, which are most active in late summer, lay their eggs on the hair of horses, different species of fly preferring different areas of attachment, such as the legs, chest, neck, and jaws. The eggs may be commonly seen on horses as small, elongated, yellow bodies, each egg being firmly attached to a hair. These eggs hatch after about 10 days, the larvae, after migrating through the tissues of the mouth, eventually locating themselves in the stomach. Occasionally odd larvae will be found in other situations. The larvae remain in the stomach for about 10 to 12 months, are passed out in the dung, pupate in the ground and eventually emerge as flies.

Symptoms.—The flies darting about laying their eggs seem to annoy horses to such an extent that they may even become panicky and gallop wildly about endeavouring to escape, often injuring themselves. Horses commonly also stand together and protect the sites where eggs are laid. When the larvae have been ingested they attach themselves to the stomach wall and grow to about ¾ inch in length. Although the stomach may be thickened where the larvae are attached, usually there are no symptoms directly traceable to the stomach, the general unthriftiness sometimes produced by heavy infestations, appearing to be possibly due to a poison secreted by the larvae, or to blood-sucking.

Diagnosis.—Unthriftiness, following the observation of numerous bot fly eggs on the horse, may be an indication of a heavy infestation, but otherwise there is no sure method of diagnosis.

Treatment.—Carbon tetrachloride is fairly effective. Treatment should be carried out in the autumn when the flies have disappeared. Carbon di-sulphide is the most effective drug but, as mentioned before, it should be administered by a veterinarian.

Prevention.—Grooming, singeing and clipping, or a weekly application of 2 per cent. phenol solution will kill eggs laid on the hairs. Washing down with hot water on a cold day is also an effective treatment, the eggs hatching out due to the stimulation of the warmth and being killed by the cold. Repellant dressings may be applied to the common areas of attachment to discourage the activities of the flies.

Tape Worms.

These worms, found in the small and large intestines, are easily recognised by their segmented appearance. Segments of the tape worm containing ripe eggs are shed by the worm and these pass out in the droppings. The eggs probably spend some time in some type of insect to complete their development. Infestation of horses is apparently by ingestion of these small insects while grazing.

Symptoms.—The usual light infestations rarely produce symptoms, but heavy infestations are said to cause digestive disturbances, unthriftiness, harsh coats and even anaemia.

Diagnosis.—Diagnosis may be made by finding the ripe segments of the worm in the droppings, or by microscopic examination of the droppings for eggs which have escaped from their segments. These segments look like boiled rice grains.

Bot Fly Larvae
Attached to Stomach Wall of Horse.
[*Illinois College of Agriculture, Circ.* 496.

Treatment.—Very little is known of the treatment of these parasites, but 60 c.c. of turpentine and 4 c.c. of male-fern extract in 1½ pints of linseed oil, after 24-36 hours starvation—or 1 oz. of kamala; or 1-1½ oz. of freshly-ground areca nut—may be useful. Extreme care should be taken in using all of these drugs.

Sheep Lice Infestation Again Reported.

DISTRICT Veterinary Officers have again stressed the position in regard to sheep lice, and infested flocks are far too numerous. In the northern district, 52,000 sheep were quarantined in September for lice infestation.

There are several external parasites of sheep, but in this State, the one which requires most action at the present time is the louse. It is realised that many small sheepmen are faced with difficulties regarding dipping, and it is suggested that control of this parasite provides an excellent field for community action. Community dips do exist in this State, and there is no reason why more should not be constructed, provided material can be secured. It is certainly to the interest of the community that sheep lice should be controlled. Sheepowners should ask themselves whether it is fair to other men to take lice-infested sheep into a saleyard.—MAX HENRY, Chief, Division of Animal Industry.

FEEDS and FEEDING NOTES.

Contributed by
The Division of Animal Industry.

Rearing Calves With Limited Whole Milk.

DUE to change over from cream to whole milk supply, many farmers have found themselves faced with the problem of rearing their calves with only limited amounts of whole milk, and little or no skim milk. Experiments on rearing calves with limited amounts of milk have been planned by the Department but, as the subject is one of urgency for some men, the following notes, based largely on experience in Great Britain and the United States, with the rearing of calves on limited amounts of milk, may be of some assistance. These "minimum milk" methods of calf rearing should not be regarded as equivalent to those methods where liberal amounts of whole and skim milk are used, but merely as substitutes which should only be used where the milk products are not available for calf rearing.

The cardinal points to be kept in mind in any system of calf rearing are:—

1. The diet of calves must contain sufficient Vitamin A, such as is contained in whole milk (not skim milk or butter milk), green feed or green hay. If the ration is deficient in Vitamin A, the resistance of the calves to such infections as scours and pneumonia is seriously decreased and growth rates are affected. Therefore, it is essential to provide some whole milk until calves commence picking at green grass or green hay.

2. Calves are unable to digest efficiently feeds other than milk products for at least the first two weeks of life.

3. After this time the ability to digest other materials, such as the starches in grains, gradually improves, but some milk products containing the vitamins and proteins of milk are essential up till at least two or three months of age if normal development and maximum resistance to disease are to be maintained.

When calves are eating some greenstuff and meals or gruels, whole milk can be gradually dropped from the ration, but some milk product must be continued. If, as is the case on the farms under consideration, neither skim milk, butter milk nor whey is available, some dried product, such as dried skim milk, must be used. Where large quantities of the dried products are available water can merely be added to the material at the rate of 1 lb. per gallon to make a gruel equal in food value to skim milk, but where supplies are limited, as they are at present, the available quantity can be used to best advantage in a mixed meal or gruel.

A suggested mixture which may be used dry as a meal or made up as a gruel is as follows:—

	Per cent.
Dried skim milk or butter milk ..	20
Bran or crushed oats	18
Crushed wheat, barley, maize or pollard	40
Linseed meal, cocoanut meal or peanut meal	20
Bone meal	1
Salt	1
	100

The types and proportions of the materials other than the milk product are not of extreme importance, but the milk product should not be reduced below about 20 per cent., and, if the material is available, it should be increased to 30 per cent. Some oil meal, preferably linseed meal, should always be included in the mixture.

The meal may be placed in the bottom of the milk bucket after feeding the milk till the calves have become accustomed to it, and it may then be fed in a trough. Gruels should be fed by individual bucket at blood temperature (100 deg. Fahr.), and the usual hygienic precautions such as scalding of the buckets after each feed should not be overlooked.

The gruel is prepared by mixing 1 lb. of the meal with a little cold water to form a mixture more or less of the consistency of

paste, and then adding warm water up to 1 gallon. It is not absolutely necessary to boil this mixture, as boiling does not increase digestibility to any extent and involves considerable labour and expense, but it may improve the palatability of the gruel.

The following is a summary of a suggested method of feeding, using whole milk and gruels, about 15-20 gallons of whole milk being used per calf.

First two weeks.—Colostrum and whole milk on a basis of about 1 lb. of milk per 10 lb. live weight.

3rd to 4th week.—Commence the third week with about 3 quarts of whole milk and 1 quart of gruel per day, gradually increasing the proportion of gruel till at the end of the 4th week, whole milk has been completely replaced by gruel. Also, at the beginning of the third week introduce a little dry meal, as used for making the gruel, and lucerne hay.

5th to 6th week.—Feed 4 to 5 quarts of gruel per day, and allow access to dry meal.

7th to 8th week.—Reduce the gruel gradually, allowing plenty of water to make up for the fall in liquid intake, and increase the hay and meal allowance as the gruel is decreased. At the end of the 8th week gruel can be eliminated and the calves may be allowed up to 2 to 2½ lb. of meal per day.

After the 8th week calves may be raised on meal, hay and pasture. At 12 weeks the milk product may be dropped from the meal, but it is preferably continued until 4 to 5 months.

The following summarises the feeding on whole milk and meals, about 35 gallons of whole milk being used per calf:—

1 to 3 weeks.—Colostrum and whole milk, introducing a little meal and hay towards the end of the third week, by which time calves should be receiving about 8 to 10 lb. of milk per day.

4th week.—Whole milk, 3 quarts. Meal, ¼ lb. per day.

5th week.—Whole milk, 3 quarts. Meal, ¼ to ½ lb. per day.

6th week.—Whole milk, 2 quarts. Meal, ½ to ¾ lb. per day.

7th week.—Whole milk, 2 quarts. Meal, ¾ to 1 lb. per day.

8th week.—Whole milk, 1 quart. Meal, 1½ to 2 lb. per day.

9th week.—Meal only.

Again at 12 weeks the milk product may be dropped from the meal mixture. Of course, if desired, the meal could be given in the form of gruel.

For calves of the smaller breeds, and any calf not normally robust, larger quantities of milk than those given in the tables will probably be necessary. It should be remembered also that the above quantities are not definite standards, but only guides which will have to be varied according largely to the progress of the calf. Where good pasture and hay are available the amount of meals can be considerably reduced, but, in any case, calves should have some good hay, such as lucerne hay, made available to them as soon as they develop an appetite for it.

Calves have, at times, been reared on smaller amounts of whole milk and milk products than those suggested—by changing over at, say, 1 week of age to gruels containing no milk products. However, if the aim is, as it should be, to rear well-developed calves with no losses, then the investment in the calf by way of providing reasonable amounts of whole milk and milk products should be found worth while.

IMPRESSIVE RESULTS FROM GOOD FEEDING.

An Example of the Value of Pasture Improvement and the Use of Conserved Fodder.

THE following facts recorded by the owner of a property of 1,400 acres in the Capertee (Central Tablelands) district, and the Inspector of Stock (Mudgee), Mr. C. White, show the results that can be obtained by the use of good methods of pasture management and feeding.

In 1934 the property was taken over by the owner in a badly-eroded and rabbit-infested state. The pastures consisted of the poorer type of natural grasses and bracken, with practically no clover or herbage. The first steps in attempting the reclamation of the property were top-dressing with superphosphate, sowing of subterranean clover and lucerne, and subdivision into twenty-nine paddocks.

The merinos originally on the property were replaced by Corriedales, and supplementary winter feeding during lambing was introduced as a routine practice.

Although the average rainfall during 1935-1942 was nearly 5 inches below the accepted average for the district (28 inches), careful management prevented deterioration of the pastures, soil erosion was checked, and the better types of natural grasses and the natural clovers reappeared.

The Progress Made.

The figures relating to the property are impressive.

Carrying Capacity.

1934—approximately 0.3 sheep per acre (small Merino wethers).

1942—approximately 2 sheep per acre (Corriedale crosses).

Wool Production.

1934—4.1 lb. per head (Merino).
1942—10.5 lb. per head (Crossbred).

Wool Returns from Sheep.

1934—3s. 1d. per head.
1942—15s. 9d. per head.

Gross Return per Acre.

1934—less than 3s. per acre.
1942—35s. per acre.

Naturally these impressive results were not obtained without considerable expenditure on machinery, fertiliser, seed and labour, but these items were rightly regarded by the owner as long-term investments.

The results show that it is not necessarily the recognised "good" districts that are the best financial propositions for intensive improvement, but that neglected and impoverished land which can be taken over at comparatively low cost can be effectively and economically reclaimed—a policy of benefit to the individual as well as the nation. In the words of the owner, the achievement "conveys the idea of how even a very neglected holding can be reclaimed by the help of modern scientific methods."

More and Better Feed Provided.

The underlying reason for this remarkable improvement in the carrying capacity and returns from this property is, of course, the higher yield of food matter per acre, and the provision of a year-round high plane of nutrition for the stock, this being obtained by:—

(*a*) Improvement of the food value of the pastures by stimulation of the better types of natural grass and clovers;

(*b*) Provision of winter growing grasses such as ryes, and winter fodder crops such as oats; and

(*c*) Supplementary feeding with conserved fodder when pastures are inadequate so that the stock, especially the "productive" stock, *i.e.*, lambing ewes and the lambs, suffered no check due to malnutrition.

Probably the two most important points to be borne in mind when undertaking intensive improvement are: (1) That high carrying capacity entails a rapid disappearance of pastures when seasonal conditions are adverse and creates a greater tendency towards worm infestation, and (2) that improvement in nutrition increases the incidence of such diseases as entero-toxaemia and pregnancy toxaemia caused by having ewes overfat.

It is essential, therefore, that pasture improvement and increased carrying capacity should be linked with intensive fodder conservation and close attention to disease prevention and control.

Comparative Returns from Grain Feeding of Pigs and Cattle.

GRAIN fed to milking cattle frequently gives financial returns equal to or better than grain fed to pigs. However, it is not an uncommon sight to see dairy cattle restricted in production because of insufficient feed, and pigs being heavily fed on grain.

It is suggested that better returns might often be obtained by using some of the grain for the cattle. For instance, assuming that a cow is obtaining sufficient protein from some protein-rich feed such as lucerne hay, then 3½-4 lb. of grain will provide the extra energy or starch units to provide for production of an extra gallon of milk. With milk returning 9d. a gallon, this quantity of grain should, therefore, give a gross return of 9d. Even where protein must also be provided to increase production—such as by using a mixture of 3 lb. linseed meal with 4 lb. of maize or wheat meal—about 7 lb. of such mixture will provide for 2 gallons of milk. The linseed

meal will cost only about 4d., and there is still a return of 7d. for the 4 lb. of grain meal.

About 3½-4 lb. of grain are required for 1 lb. increase in live weight of a baconer, and as this 1 lb. increase is equivalent to only about 2/3 lb. bacon, the return for the 3½-4 lb. of grain, with bacon at 9d. per lb., is about 6d.

Thus there is a comparative gross return of about 6d. per 4 lb. of grain fed to pigs, and 7d. to 9d. when fed to cattle.

In the case of home-grown maize for cattle there is the cost of shelling and crushing, and this will, to some extent, decrease the difference in returns, and the net returns have not been considered, but it is fairly evident that if it pays to feed grain to pigs, it is at least an equally payable proposition to feed it also to the cattle.

Current Feeding Costs.

Feed.	Starch Unit Value per 100 lb.	Protein Unit Value per 100 lb.	Cost.	Cost per Starch Unit.	Cost per Protein Unit.	Remarks.
ROUGHAGES.						
Lucerne hay or chaff (good, sound).	35-45 (av. quality 40).	10	£7 10s.-£10 long ton ...	2d.-2·7d.	...	Roughages continue to be dearer, as sources of food matter, than concentrates, although the cereal roughages are about equal in price to the dearer starchy concentrates such as maize.
Oaten chaff (good, sound).	40	3	£6 10s. long ton ...	1·8d.	...	
Wheaten chaff ...	40	3	£6 10s. long ton ...	1·8d.	...	
Oaten hay	33	3	£5 10s. long ton ...	1.8d.	...	
Wheaten hay	33	3				
STARCHY CONCENTRATES.						
Wheat	72	8	3s. 6½d. per bushel in truck lots—bagged.	1d.	...	Wheat and barley, the cheapest sources of food matter, pollard and bran the next cheapest, followed by oats, with maize the dearest source of food matter. Barley meal and barley supplies very scarce.
Wheatmeal	72	8	£7 5s. short ton ...	1·2d.	...	
Maize	78	8	7s. 2d. bushel	2d.	...	
Maize meal	78	8	£14 short ton	2·2d.	...	
Barley	71	7	3s. bushel	1d.	...	
Barley meal	71	7	Not quoted.	......	...	
Oats	62	8	3s. bushel	1·5d.	...	
Crushed oats	62	8	3s. 10d. per 40 lb. ...	1·8d.	...	
Pollard	66	10	£6 short ton, f.o.r. ...	1·1d.	...	
Bran	56	10	£6 short ton, f.o.r. ...	1·3d.	...	
PROTEIN CONCENTRATES.						
Linseed meal	72	25	£9 10s.-£10 10s. short ton.	1·6d.-1·7d.	4·5d.-5d.	Supplies scarce.
Peanut meal	78	43	£6 10s. short ton ...	1·1d.	1·8d.	Supplies scarce.
Cocoanut meal ...	76	15	£7 short ton, f.o.r. ...	1·1d.	5·1d.	Supplies scarce.
Meat meal (55-60% crude protein grade).	80	55	£10 10s. short ton ...	1·6d.	2·3d.	Supplies limited and rationed.
Meat meal (45 % crude protein grade).	60	40	£10 short ton	2d.	3d.	Supplies limited and rationed.
Blood meal	63	68	£14 short ton	2·7d.	2·5d.	Supplies limited and rationed.

MINERAL SUPPLEMENTS.

Mineral.	*Cost.*	*Supplies.*
Ground calcium carbonate (limestone)—a calcium supplement.	34s. per ton in bags, (truck lots).	Supplies available.
Bone meal (a calcium and phosphorus supplement)...	£14 10s. per ton, F.O.R.	Supplies limited.
Bone flour (a calcium and phosphorus supplement)...	£11 15s. per ton, F.O.R.	Supplies available
Shell grit (a calcium supplement)	30s. per ton (bulk) ...	Supplies available
Dicalcic phosphate (a calcium and phosphorous supplement)		Unavailable.

Blood Meal for Pigs.

OWING to the present shortage of meat meals, pig farmers should be prepared to use efficiently any other protein concentrates which may be available.

Blood meal is sometimes available where meat meal is not, and equal or better results may be obtained with this product. Owing to its high protein content—70 to 80 per

cent. as against 40 to 60 per cent. in meat meal—less blood meal than meat meal is required to balance the ration, so that its somewhat higher price is justified.

In South Australian experiments, 21 lb. of blood meal were equal to 30 lb. of meat meal as a supplement to grain in bringing pigs from weaning to bacon weight. Three ounces of blood meal per day is sufficient for growing stock. This amount should be increased for suckling sows, but may be dropped entirely from the ration of baconers over the last weeks of finishing.

Palatability of blood meal may be a source of difficulty, but if well mixed in with the rest of the ration and if only gradually introduced, this trouble should be overcome.

Manurial Value of Feedstuffs.

SINCE the mention in a previous article in these notes, of the decreased drain on soil fertility that results from feeding wheat to pigs instead of selling it as grain, several enquiries on the matter have been received; it is thought that further information on the subject may be of interest.

Although pigs are fairly efficient in the conversion of plant matter to animal matter, over 70 per cent. of the nitrogen and over 90 per cent. of the phosphorus and potassium of the feeding stuffs is excreted in the dung and urine by even a growing pig. Taking, for example, a baconer which during its life consumed some 8 bushels of wheat and 30 lb. of meat meal, the amount of nitrogen, phosphorus and potassium in the excreta would be equivalent to about 50 lb. of sodium nitrate or ammonium sulphate, 30 lb. of superphosphate and 4 lb. of potash. The monetary value of the fertiliser required to supply this amount of fertilising material would, at current prices, be approximately 13s. Thus it can be readily seen that if the excreta from pigs is efficiently utilised, there is a considerable return or saving per pig.

A method of utilisation of these fertiliser constituents which has proved successful is to use the wash water from the sties for irrigation purposes. Excellent stands of maize have been produced by this practice.

The Loss on Tick-damaged Hides.

IN connection with the campaign against the cattle tick, it is sometimes asserted that the presence of the tick has little economic importance. As a matter of fact, the tick inflicts serious economic loss, and one of the ways by which it brings about this loss is by the damage it does to hides. Tick eradication is, therefore, a matter of importance, not only to the stockowners, but to all engaged in the leather industry.

It is perhaps unfortunate that representatives of the stockowners do not take the opportunity of viewing the results of tick infestation on the leather produced from the hides, as nothing would more clearly demonstrate the loss which is being sustained.

The Australian Hide and Leather Industries Board has recently determined the prices to be paid for hides of different classes, based on those of August, 1939. It is interesting to note the effect of tick on hide values. The differential prices vary, but in some of the best classes of hides the variation is over 3d. per lb. A 30 lb. hide of good quality would be worth 7s. 6d. more, free from damage, than if it was tick damaged. In other grades the difference is not so marked, but it always exists. Even if the loss were only 2s. 6d. per hide, that loss on 100,000 hides would be £12,500.

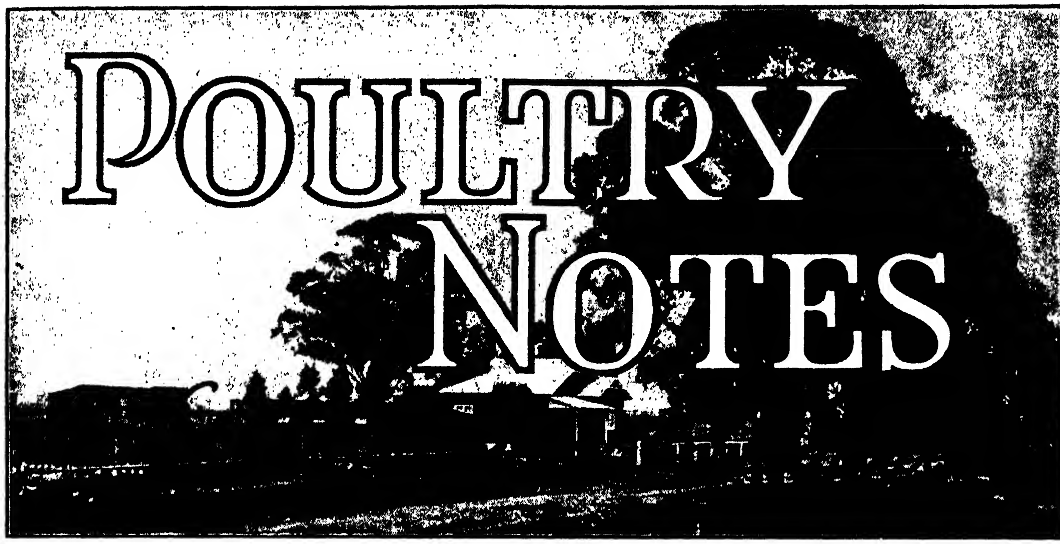
Surely it is worth while getting rid of cattle tick to eliminate this persistent loss. The loss is not fictitious. This country requires as much sound leather as it can produce, and it wants sound hides for export in normal times.—MAX HENRY, Chief, Division of Animal Industry.

To Make Silage Satisfactorily.

To make silage satisfactorily it is necessary that the crop shall be green when it is put in the silo, and that the air be excluded as much as possible. There is no difficulty in keeping the air out of pits or properly-constructed overhead silos, and therefore there is rarely any loss of silage when made in pits, though there is generally a good deal of loss when it is made in stacks.

The conservation of fodder in the form of silage is still far from generally practised, but as stockowners come to recognise that the first law of successful animal husbandry is adequate feeding, it will figure more importantly in the Australian farming programme.

Full information on the making of silage is given in pamphlets obtainable free on application to the Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney.



Methods of Increasing Flocks.

The Risk with Late-hatched Chickens.

Many poultry farmers, in an endeavour to raise more chickens this season, have obtained chickens later than usual, and some even placed orders for chickens during the month of November. Unfortunately heavy losses have already been sustained among these late-hatched chickens, and it will be found that in most cases where chickens survive they will be two or three months longer coming into production than those hatched prior to the end of September.

The weather conditions this season have not been ideal for rearing chickens, owing to the frequent spells of wet weather, and this, together with the fact that in many cases the rearing equipment has been taxed to its capacity throughout the season, has resulted in outbreaks of disease which have taken a heavy toll of chickens.

The only conditions under which chickens hatched after the end of September are likely to thrive satisfactorily are where the rearing equipment has not been used earlier in the season and the chickens have plenty of range after they are ten to twelve weeks

Well-grown Early Hatched Heavy Breed Chickens.

old. It is also important that they should not be housed in large numbers or overcrowded in the houses.

Late Summer Hatching.

A more satisfactory method of increasing flocks than attempting to raise chickens hatched after the end of September, is to undertake a short rearing season at the end of the summer, say between the end of January and the middle of March, but here again it is essential that the chickens be raised on ground which has been spelled for several months or on fresh ground. It will be found that these chickens, if raised under good conditions, will thrive better than those hatched between September and December. The main reason for this appears to be that chickens hatched after the end of September have to pass through the hottest part of the summer when they are about half grown, and this causes a setback in development, whereas those hatched between January and March encounter the hot weather while they are still young, and grow well during the cooler weather of the autumn.

One of the disadvantages of raising chickens at the end of the summer, however, is that if chicken pox is prevalent, the young chickens are likely to contract the disease before they can be protected by vaccination.

Retaining Second-year Hens.

As the production of eggs is a matter of national importance under present conditions, the question of holding all hens which are likely to continue to lay should be seriously considered by all poultry farmers where accommodation is available for holding them without unduly crowding the flocks or utilising plant which will be required for this season's pullets.

As pointed out in these Notes several months ago, one of the best means of increasing the production of eggs is to retain any second-year hens which continue to lay, rather than follow the usual course of culling heavily from December onwards. It is, of course, useless to retain hens which break into a moult, unless facilities are available for housing them intensively during the autumn to bring them back into production earlier than would otherwise be the case.

Under ordinary conditions over 2,000,000 hens in this State would be marketed between December and April, but if half this number could be retained, the egg production from them would add considerably to the total output.

Every effort is now being made by the Commonwealth authorities to make available materials, equipment, and labour to poultry farmers for increasing production, and it is hoped that in the near future many of the difficulties experienced by the poultry industry in securing supplies will be overcome. However, those contemplating extension of operations should place orders for the materials required well ahead, as it will probably be some time before sufficient materials, etc., will be made available for all requirements.

Management of Flocks During the Summer.

DURING the summer there are many points in management which make a great deal of difference in the returns from a poultry farm, and the maintenance of satisfactory egg production depends greatly upon the efficiency of the management.

As far as the layers are concerned, close attention to feeding is necessary to ensure seasonable continuity of production. Faulty methods of feeding are often responsible for failure to secure satisfactory egg production during the summer and autumn. It will be found that, during hot spells, the birds do not require as much food as usual, and unless judgment is exercised in feeding, there is likely to be a sharp drop in production due to the hens becoming surfeited with food, resulting in digestive troubles. The best course to follow during a hot spell of weather is to reduce the usual quantity of food in accordance with the appetites of the birds, so that no food is allowed to lie around throughout the day. In fact, on very hot days it is preferable to keep the birds rather keen for their meals, and when a cool change comes, to increase gradually again to the normal quantity.

Strict attention should be paid to the watering arrangements to ensure that fresh water is provided and kept as cool as possible. The water vessels should be placed in close proximity to the houses so that the birds do not need to traverse long distances

during the heat of the day to obtain water, as this often leads to high mortality. Where automatic watering systems are installed, it is necessary to see that the vessels are kept free from contamination by mash or other organic matter which may cause fermentation, and the water vessels should be shaded.

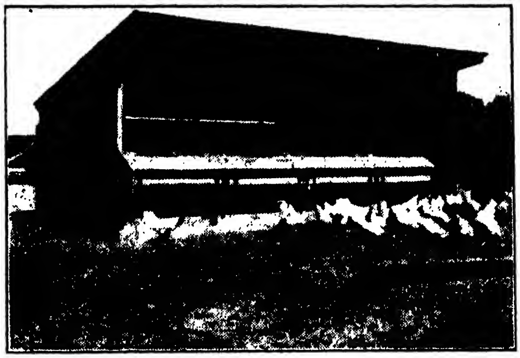
Ventilation of Houses.

It is important also in the management of layers to ensure proper ventilation of the houses. To provide suitable ventilation, an aperture at least 4 to 6 inches deep should be left along the top of the back wall under the roof in order that a current of air can pass through the house. This keeps the air circulating and assists in keeping the house cooler on hot days. The deeper the house the larger the aperture required, but where more than 6 inches is allowed it is advisable to have an adjustable shutter which can be opened in the summer and closed in the winter.

Lack of ventilation is one of the causes contributing to outbreaks of "roup" diseases, particularly towards the end of the summer when the humidity is high.

In hot weather a space of at least 20 inches should be allowed between the perches in order to ensure a current of air between the rows of birds on the perches. It should be realised that when birds are packed together on hot nights they suffer severely through becoming overheated, and this has an adverse effect upon egg production. Such conditions are also frequently responsible for birds breaking into a moult much more quickly than would otherwise be the case.

In some instances the perches are moved when the houses are being cleaned and are not put into position again, and to avoid this occurrence it is advisable to have slots in the roost supports or some other means of keeping the perches in their correct positions. The usual practice is to have the back perch about 15 inches from the wall and the other perches 20 to 24 inches apart and 18 to 20 inches above the floor. It is a mistake to have the perches fitted in step-ladder fashion, as this results in the majority of the birds attempting to get on to the highest perch—which leads to overcrowding.



Semi-intensive House, showing Aperture along Back for Ventilation.

Treatment of Birds During Heat-waves.

Each year thousands of birds are lost as the result of excessive heat, though the majority of them could be saved if they were handled properly.

In the first place, attention should be given to the ventilation of the houses and the spacing of the perches as indicated previously.

It is important that the farm should not be left without someone in charge who is capable of handling the birds during heat-waves. When the temperature rises above 103 deg. Fahr. it is necessary to make a continual round of the pens to see that no birds are becoming prostrated with the heat. Sometimes it is necessary to disturb gently any birds which are lying on the floor, to see if they are affected. Those which are commencing to suffer will not move readily and will exhibit obvious signs of distress. Such birds should be removed from the house and water should be applied freely to the head and under the wings and they should then be placed in a shady spot, preferably where there is a current of air, and the ground should be well watered to cool the birds as much as possible. The birds should not be allowed to pack into the nest boxes as they often do in an endeavour to find a cooler spot. Regular rounds of the pens should then be made as long as the temperature remains over 100 deg.

On excessively hot days it might be necessary to water the floors of the houses to reduce the temperature, but if there is scratching litter on the floors and this becomes saturated, it is advisable to remove it before evening, otherwise humid conditions would be created during the night.

There is ample evidence that if the procedure outlined is carried out, losses are reduced to a minimum even during the worst heatwaves.

Clean Up Chicken Rearing Equipment.

ONE of the most important matters to which attention must be given at the end of the rearing season is to clean and disinfect thoroughly all the rearing equipment as the the pens are emptied for the season. This work is often neglected, and the pens are not cleaned until they are required again the next season. Although under present conditions it may be difficult to provide labour to carry out such work, no effort should be spared to clean up the pens as soon as possible after the chickens are removed.

As far as the brooder houses are concerned, all the interior fittings, including the floor and lower walls, should be thoroughly scrubbed and the whole of the shed sprayed with a strong disinfectant. The outside runs should also be thoroughly cleaned and left open to the weather. If the pens become overgrown with weeds, it is advisable to cut down the growth to allow the sun to penetrate to the surface of the ground, but after the pens have been spelled for a few months the grass may be allowed to grow.

POULTRY farmers are reminded that applications for pens in the 1944-45 Egg Laying Competition to commence at Hawkesbury Agricultural College, Richmond, on 1st April, 1944, will close on 5th January, 1944, by which date the application form showing particulars of stock owned at 31st December, 1943, must be in the hands of the Principal, Hawkesbury Agricultural College, Richmond, New South Wales.

Where the pens have been in use for several years, or there has been an outbreak of disease, such as coccidiosis or worm infestation, during the season, it is advisable to remove 3 to 4 inches of the surface soil, and fill in again with clean, fresh soil which should be allowed to settle down thoroughly before the pens are required again.

Other small chicken pens, such as weaning pens, should be treated in a similar manner to the brooders, keeping in mind that by thoroughly scrubbing the floors and fittings a disinfectant will be more effective.

As far as colony houses are concerned, the floors of these should be scrubbed and disinfected and any bare parts of the runs thoroughly swept.

Growing Crops in Pens.

Many poultry farmers grow crops in chicken pens with the object of sweetening the soil and providing green feed for the chickens, but if the pens are contaminated with worm eggs or disease germs the growing of such crops only serves to protect the organisms in the ground, whereas if the surface is left open to the weather many of the organisms are killed. It is much more satisfactory to grow a green feed crop which can be cut and fed to the chickens as required. Crops grown in the pens soon become trampled down and contaminated when the chickens are allowed to run in the pens.

Well-grown Chickens on a Grassy Run.

If poultry farmers realised the importance of proper sanitation, and of spelling the chicken-rearing equipment for several months each season, there would be far less trouble in rearing chickens and better development would be obtained.

No Restriction on Poultry Numbers.

IT has been pointed out by the Minister for Agriculture (Hon. W. F. Dunn, M.L.A.) that there appears to be a misapprehension in the minds of many that there is a restriction on the number of fowls that may be kept.

There are two separate classes of persons to be considered in connection with this question; explained the Minister, namely (*a*) those desiring to keep fowls for the production of eggs to be consumed by their own household; and (*b*) those keeping fowls for production of eggs for sale. In neither instance is there any restriction on the number of fowls that may be kept, and where eggs are not produced for sale no permission or registration is necessary. Where persons wish to sell eggs, however, they must, if they keep more than twenty fowls, apply for a producer's selling permit to the Deputy Egg Controller, c.o. Egg Marketing Board, Wattle-crescent, Pyrmont. The Minister for Commerce and Agriculture has announced that this number is to be increased to forty as soon as the necessary administrative adjustments can be made.

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number Tested.	Expiry Date.
		1943.
W. J. Stephenson, "Hill View," Fig Tree ...	57	1 Nov.
Wollongbar Experiment Farm...	112	4 "
Barnardo Farm School, Mowbray Park ...	75	4 "
A. E. Liggins, "St. Leger Dairy," Kuring-gai Chase Road, Turramurra North	52	7 "
Australian Missionary College, Cooranbong ...	113	8 "
A. L. Logue, "Thornbro," Muswellbrook ...	46	13 "
Woomargama Estate	207	22 "
A. Hannaford, Braidwood	20	26 "
W. S. Grant, Braidwood	20	26 "
Department of Education, Gosford Farm Home	40	29 "
Berry Training Farm, Berry	162	31 "
State Penitentiary, Long Bay	10	9 Dec.
		1944.
Limond Bros., Morisset	60	13 Jan.
J. M. Turnbull, "Pastime," Kayuga Road, Muswellbrook	75	15 "
E. R. Fishlock, Fig Tree, Wollongong ...	38	18 "
Penney, C. A., "Bringa," Dapto	198	25 "
St. Ignatius College, Riverview	25	27 "
Department of Education, Yanco Agricultural High School	69	6 Feb.
Riverina Welfare Farm, Yanco	74	6 "
St. John's College, Armidale	30	8 "
A. C. O'Dea, Perry Street, Dundas	28	14 "
McGarvie Smith Animal Health Farm, Liverpool	55	22 "
C. Wilton, Bligh Street, Muswellbrook ...	75	3 Mar.
N. L. Forster, Abington, Armidale (Aberdeen Angus)	188	12 "
Forster and Sons, Abington, Armidale (Jerseys)	87	13 "
Lunacy Department, Morisset Mental Hospital	84	15 "
Wagga Experiment Farm (Jerseys)	81	20 "
Trangie Experiment Farm, Trangie	121	20 "
New England University College, Armidale ...	12	31 "
St. Michael's Orphanage, Baulkham Hills ...	18	31 "
W. H. Long, Brodie's Plains, Inverell ...	44	13 April.
A. G. Wilson, "Blytheswood," Exeter ...	62	14 "
H. F. Bradley, "Nardoo," Ashford Road, Inverell	35	15 "
Grafton Experiment Farm	191	15 "
Lunacy Department, Callan Park Mental Hospital	26	1 May.
T. J. Wilks, "Oaks Farm," Muswellbrook ...	37	5 June.
E. J. Cottell "Kapunda," Rob Roy, Inverell	50	23 "
L. W. Campbell, "Dunmallard," Fern Hill Road, Inverell	32	23 "
E. D. Rankins, "Oakwood," Inverell ...	23	23 "
J. O. McGufficke, "Lovely Bank," Rob Roy, Inverell	20	23 "
J. H. Lott, "Bellevue," Rob Roy, Inverell ...	23	23 "
Cowra Experiment Farm	66	24 "

Owner and Address.	Number Tested.	Expiry Date.
		1944.
New England Experiment Farm, Glen Innes (Jerseys)	73	27 June.
G. T. Reid, "Narrengullen," Yass	274	3 July.
Farm Home for Boys, Mittagong	49	9 "
Lunacy Department, Rydalmere Mental Hospital	50	19 "
St. Vincent's Boys' Home, Westmead ...	26	20 "
Lidcombe State Hospital and Home	106	30 "
Hurlstone Agricultural High School, Glenfield	37	31 "
Ebsman Bros., Inverell	28	13 Aug.
E. L. Killen, "Pine Park," Mumbil	252	24 "
Peel River Land and Mineral Co., Tamworth (Beef Shorthorns)	82	28 "
Bathurst Experiment Farm	24	9 Oct.
Lunacy Department, Gladesville Mental Hospital	34	23 Nov.
Hawkesbury Agricultural College, Richmond (Jerseys)	110	18 Dec.
		1945.
The Sydney Church of England Grammar School, Moss Vale	51	5 Feb.
Koyong School, Moss Vale	2	8 "
New England Girls' Grammar School, Armidale	30	11 "
W. W. Martin, "Narooma," Urana Road, Wagga	143	22 "
R. C. Dixon, Elwatan, Castle Hill (Jerseys) ...	31	29 Mar.
Lunacy Department, Parramatta Mental Hospital	66	30 "
A. E. Stace, Taylor Street, Armidale	38	1 April.
A. D. Frater, King's Plain Road, Inverell ...	123	12 "
F. C. Harcombe, Hillcrest Farm, Warialda Road, Inverell	38	13 "
Parker Bros., Hampton Court Dairy, Inverell	180	17 "
H. F. White, Bald Blair, Guyra (Aberdeen Angus)	186	30 "
Emu Plains Prison Farm	108	7 May
A.G.H. (114) Australia...	70	11 "
Sir F. H. Stewart, Dundas	12	5 June.
Kahlua Pastoral Co., "Kahlua," Coolac ...	205	21 "
S. E. E. Cohen, Auburn Vale Road, Inverell...	33	22 "
B. N. Coote, Auburn Vale Road, Inverell ...	79	22 "
A. N. De Fraine, Reservoir Hill, Inverell ...	28	22 "
J. McKenzie, Inverell	19	17 Aug.
W. J. Frizelle, Rosenstein Dairy, Inverell ...	93	17 "
W. Budden, "Hunter View," Kayuga Road, Muswellbrook	17	24 "
Farrer Memorial Agricultural High School, Nemingha	36	30 "
Fairbridge Farm School, Molong	97	7 Sept.
The William Thompson Masonic School, Baulkham Hills	42	16 "
Navua Ltd., Grose Wold, via Richmond (Jerseys)	116	20 "

Tubercle-free Areas.

The following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis:—

Bombala Area. Municipality of Muswellbrook.
Inverell Area. Municipality of Queanbeyan.
Braidwood Area.

MAX HENRY, Chief of Division of Animal Industry.

EARLY recognition of disease in the udder is important in the prevention and control of mastitis (mammitis) in dairy herds. A careful watch should be kept on every quarter at each milking. Slight signs of inflammation can be detected easily enough if looked for. If a quarter is swollen and feels hot it is usually infected. Sometimes there are no signs of swelling or heat in the quarter, but the milk is altered or contains clots. Clots can be detected most easily by passing the first few streams of milk into a "strip cup" made by fitting a movable strainer of fine wire gauze into a tin pannikin. The use of the "strip cup" is strongly recommended and the test should be used on every cow once a day if possible.

Any cows showing signs of mastitis should be taken out of the line and milked last.

The dairy farmer will find much useful information on mammitis in a leaflet obtainable free on application to the Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney.

Abortion-free Herds.

THE following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion-free :—

Owner and Address.	Number in herd.
A.G.H. (114) Australia	70
Bathurst Experiment Farm (Ayrshires)	24
Bauerle, P. A., Holbrook	12
Bush, W., Ben Lomond	30
Callan Park Mental Hospital	41
Carrick G., "Clonlea," Central Tilba	37
Cowley, L., Redbourneberry, Singleton	56
Cowra Experiment Farm (Ayrshires)	71
Department of Education—Farm Home for Boys, Gosford	36
Department of Education—Farm Home for Boys, Mittagong	36
Dixson, R. C., "Elwatan," Castle Hill	24
Fairbridge Farm School, Molong	93
Farrer Memorial Agricultural High School, Nemingha	35
Forster and Sons, Abington, Armidale (Jerseys)	262
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	188
Gladesville Mental Hospital	34
Hann, O., Chatsworth Road, St. Mary	35
Hawkesbury Agricultural College, Richmond (Jerseys)	108
Hicks, A. A., Estate, Culcairn	52
Hill, E. Pritchard, Bowling Alley Pt. (Jerseys)	96
Hordern, E. D., Cabramatta (A.I.S.)	95
Hurlstone Agricultural High School, Glenfield	39
Killen, E. L., "Pine Park," Mumbil	223
Leitch .J. F., "Tunbridge," Merriwa (Aberdeen-Angus)	72
McEachern, H., Tarcutta (Red Poll)	52
Martin Bros., "Narooma," Urana-road, Wagga	145
Morisset Mental Hospital	81
Navua Ltd., Grose Wold, via Richmond (Jerseys)	122
New England Experiment Farm, Glen Innes (Jerseys)	97
New England University College, Armidale	5
Peel River Land and Mineral Co., Tamworth	82
Reid, G. T., "Narrangullen," Yass	171
Robertson, D. H., Scone	82
Rydalmere Mental Hospital, Rydalmere	57
Salway, A. E., Cobargo	95
Skinner, D. S., "Wyworrie," Ben Lomond	38
Smith, Jas. C., Ben Lomond	83
Stewart, Sir Frederick, "S . Cloud Stud" Spurway-street, Dundas	9
Trangie Experiment Farm, Trangie	121
Wagga Experiment Farm, Wagga, N.S.W.	45
Walker, Jas. R., "Strathdoon," Wolseley Park	32
White, F. J., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	189
Williams, Chas., Ben Lomond	27
Wilson, A. G., "Blytheswood," Exeter	62
Young, A. H., "Rock Lynn," Cudal (Polled Beef Short-horns)	12

MAX HENRY, Chief of Division of Animal Industry.

Brucellosis-free Herd Scheme (Swine).

LIST OF ACCREDITED HERDS.

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Adams, J. P., "Melton," Daysdale.
Bathurst Experiment Farm, Bathurst
Boardman, C., Camden.
Campbell, D., Hillangrove, "Wamberal," via Gosford.
Chapman, G. E. and Son, "Illabo Park," Alectown.
Cocks, F. D., "Condalarra," Gooloogong.
Cowra Experiment Farm, Cowra.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., "Glengar," Capertee.
Farrer Memorial Agricultural High School, Nemingha.
Fisher, J. R., Furlong's Stud Farm, Richmond-road, Blacktown.
Foley, Mrs. E., Bligh Stud Piggery, Water Lane, Rouse Hill.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Holland, A. L., Argonne, Tubbul.
Hurlstone Agricultural High School, Glenfield.
Maybin, N. C., Towac, Orange.
McBride, J. L., "Belvedere," Camden.
McCaughey Memorial Agricultural High School, Yanco.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Government Agricultural Training Farm, Scheyville.
Shirley, G. F., "Camelot," Penrith.
Smith, J. M., Eulo Glen, Urana.
Stewart, Sir Frederick, "St. Cloud," Dundas.
Wagga Experiment Farm, Wagga.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., "Gwandalan," Grenfell.
Wilson, A. G., Blytheswood, Exeter.
Wollongbar Experiment Farm, Wollongbar.

Herds Other than Registered Stud Herds.

A.G.H. (114 Australia).
Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Croft, H. M., "Salisbury Court," Uralla.
Glen Innes Prison Camp, Glen Innes.
Gosford Farm Home for Boys, Gosford.
Goulburn Reformatory, Goulburn.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital, Orange.
Parramatta Gaol, Parramatta.
Peat and Milson Islands Mental Hospital, Hawkesbury River.
Pollak, V., Marata, Harrow Road, Glenfield.
Smith, C. W. J., "Norbiton," Canadian Lead.
Stockton Mental Hospital, Stockton
Yanco Agricultural High School.

The Agricultural Gazette.
DECEMBER, 1943.

THE MORE FOOD *THE LESS WAR.*

COMMONWEALTH and States are united in a campaign to foster food consciousness on the part of producers, consumers and all who are in any way concerned with food consumption or production.

It is not an easy task to convince consumers that they must be prepared to do without certain foodstuffs, and suffer rationing of others, particularly at a time when primary production (in total, if not in all lines) promises to establish an all-time Australian record.

Nor is it less difficult to continue effectively to urge the farmer to greater efforts in view of his achievements to date, and in face of the many obstacles which still remain in his path—shortages of labour, machines, materials and transport. Assurances have been given that the rate at which those obstacles are being removed will be accelerated, even if manufacturers find it less profitable to produce farmer requirements than munitions.

If consumers, producers and manufacturers would accept as their slogan: "The more food, the less war", there would be less inclination than at present for consumers to complain of what are, after all, trivial inconveniences, less insistence by farmers for the total removal of all obstacles before knuckling down to the real task, and greater celerity on the part of manufacturers in changing over their operations to the now more important food front.

The old question: "How are we going to win the war?", has now given way to: "How long will it take us to win?" The answer to this latter question depends perhaps more upon an abundance of food than upon anything else. Let us set about shortening the war by not only producing in abundance, but by voluntarily limiting civilian consumption to bare necessities, thus leaving a bigger balance to be "exchanged" with our allies for increased hitting power to batter the enemy into *quick* and unconditional surrender.

To Assist Fodder Conservation.

Rail Rebates on Silo Materials.

FREIGHT rebates on the carriage of materials required by farmers for the building of silos and sheds for the conservation of fodder, and also on wire netting for the protection of conserved-fodder crops, have been made by the Commissioner for Railways.—(*Continued on page* 544.)

Winter Cereals for 1944 Sowing.

Varieties Recommended.

WHEAT.

AUSTRALIAN wheat growers are naturally anxious to grow those varieties which will give them the greatest return per acre. Quite apart from the premiums paid by local millers for very high baking quality samples, it will ultimately be to the benefit of New South Wales farmers as a whole to retain a certain standard of quality which will help to enhance the reputation of their wheats on the world's markets. In recommending these varieties the Wheat Advisory Committee is attempting to eliminate the poorest quality wheats, such as Free Gallipoli and Baringa, at least where these do not outyield better baking quality varieties. Good wheat is the basis of good bread, and it is desired to stress the value of good bread in the national diet in wartime. For these national reasons, as well as in the farmers' own interests, producers should adhere to the recommendations made for their zones. Two or three tried varieties differing somewhat in maturity are easier to keep pure than a collection of varieties of doubtful value.

The committee has been somewhat perturbed by the large proportion of Bencubbin grown, and it is suggested that where Nabawa is known to yield as heavily it might, in part at least, replace Bencubbin.

Recommendations can only alter slowly, if at all, in the absence of normal variety testing, which has been suspended because of wartime conditions. Varietal recommendations for wheat, oats and barley for 1943 will, therefore, be continued during 1944. Unless otherwise mentioned the varieties of wheat recommended for 1944 sowing, as listed below, are suitable for both grain and hay. The accompanying map shows the wheat zones.

Varieties are classed as suitable for "Early Sowing," "Mid-season Sowing" and "Late Sowing" in relation to the normal range of sowing dates for the district. Wheats suitable for early sowing are usually late maturing, and if sown late they may be prematurely hayed off by excessive heat and may also be more liable to destruction by rust. On the other hand, early maturing varieties suitable for "Late Sowing" may, if sown early, come into head prematurely and be destroyed by frost or cold damage. Early maturing varieties should, therefore, *not* be sown early, nor should late maturing varieties be sown late.

NORTHERN WHEAT BELT.

Zone 1: Northern Tableland.

(Armidale, Glen Innes.)

Mid-season Sowing—Ford, Eureka 2.
Late Sowing—Eureka.

Zone 2: North-western Slopes—Eastern Portion.

(Warialda, Delungra, Inverell, Bingara, Barraba, Attunga, Tamworth, Quirindi and Upper Hunter Districts.)

Early Sowing—Fedweb 1, Ford.
Mid-season Sowing—Bencubbin (light soils), Ford, Eureka, Eureka 2.
Late Sowing—Gular, Pusa 4, Pusa 111.

Zone 3: North-western Slopes—Western Portion.

(Manilla, Somerton, Curlewis, Gunnedah, Boggabri, Mullaley, Tambar Springs.)

Early Sowing—Fedweb 1, Ford.
Mid-season Sowing — Bencubbin, Eureka, Eureka 2.
Late Sowing—Gular, Pusa 4, Pusa 111.

Zone 4: North-western Plains.

(Boggabilla, Garah, Gravesend, Pallamallawa, Bellata, Narrabri, Baan Baa, Wee Waa, Pilliga, Baradine, Coonamble.)

Early Sowing—Ford, Fedweb 1 (in limited) areas).
Mid-season Sowing — Bencubbin, Eureka, Eureka 2.
Late Sowing—Gular, Pusa 4, Pusa 111.

CENTRAL WHEAT BELT.

Zone 5: Central Tableland.

(Bathurst to Orange Districts.)

Mid-season Sowing—Bordan, Ford, Waratah.
Late Sowing—Waratah.

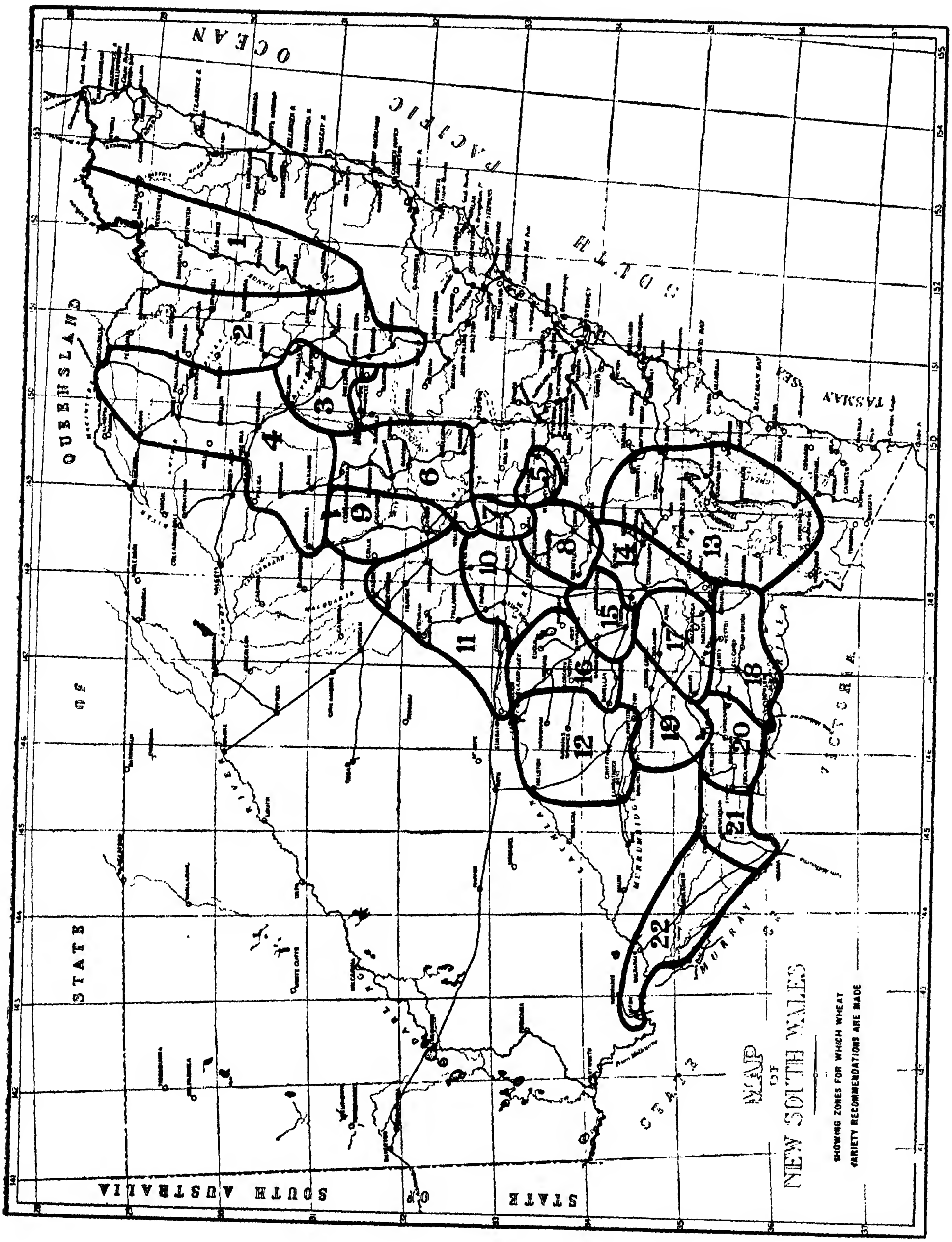
Zone 6: Central-western Slopes—North-eastern Portion.

(Coonabarabran, Binnaway, Mendooran, Leadville, Coolah, Dunedoo, Gulgong, Mudgee, Wellington, Geurie.)

Early Sowing—Ford, Bordan.
Mid-season Sowing—Bencubbin, Baroota Wonder (for hay only), Eureka 2.
Late Sowing—Gular, Eureka.

Zone 7: Central-western Slopes—Central-eastern Portion.

(Molong, Manildra, Cumnock, Cudal, Cargo.)
Early Sowing—Bordan, Ford.
Mid-season Sowing—Waratah, Bencubbin.


MAP
OF
NEW SOUTH WALES
SHOWING ZONES FOR WHICH WHEAT
VARIETY RECOMMENDATIONS ARE MADE
QUEENSLAND
SOUTH PACIFIC OCEAN
TASMAN SEA
STATE OF SOUTH AUSTRALIA
STATE OF VICTORIA

Zone 8: Central-western Slopes—South-eastern Portion.

(Cowra, Canowindra, Eugowra, Goolagong, Koorawatha, Greenethorpe, Grenfell.)

Early Sowing—Bordan, Ford.
Mid-season Sowing—Dundee (for grain only), Waratah, Bencubbin.

Zone 9: Central-western Slopes—North-western Portion.

(Tooraweenah, Gulargambone, Gilgandra, Eumungerie, Dubbo, Wongarbon, Tomingley.)

Early Sowing—Ford.
Mid-season Sowing—Dundee (for grain only), Bencubbin.
Late Sowing—Gular.

Zone 10: Central-western Slopes—South-western Portion.

(Parkes, Forbes, Bogan Gate, Peak Hill, Trundle.)

Early Sowing—Ford.
Mid-season Sowing—Dundee (for grain only), Bencubbin.
Late Sowing—Gular.

Zone 11: Central-western Plains—Northern Portion.

(Albert, Tottenham, Trangie, Narromine, Condobolin, Euabalong.)

Early Sowing—Bencubbin, Baroota Wonder (for hay only).
Mid-season Sowing—Gular.

Zone 12: Central-western Plains—Southern Portion.

(Cargelligo, Tullibigeal, Hillston, Merriwagga, Weethalle, Rankin's Springs, Yenda, Griffith.)

Early Sowing—Bencubbin.
Mid-season Sowing—Gular.

SOUTHERN WHEAT BELT.

Zone 13: Southern Tableland.

(Goulburn, Yass, Federal Territory.)

Mid-season Sowing—Ford, Waratah.

Zone 14: South-western Slopes—Eastern Portion.

(Young, Boorowa, Bendick Murrell, Murrumburrah, Wallendbeen, Cootamundra, Stockinbingal.)

Early Sowing—Bordan, Ford.
Mid-season Sowing—Waratah, Bencubbin.

Zone 15: South-western Slopes—Central Portion.

(Bribbaree, Quandialla, Caragabal, Temora, Ariah Park, Barmedman.)

Early Sowing—Bordan, Ford.
Mid-season Sowing—Dundee (for grain only), Bencubbin.

Zone 16: South-western Slopes—Western Portion.

(Wyalong, Ungarie, Barellan, Ardlethan, Tallimba.)

Early Sowing—Ford.
Mid-season Sowing—Dundee (for grain only), Bencubbin.
Late Sowing—Gular.

Zone 17: North-eastern Riverina.

(Junee, Marrar, Coolamon, Wagga, Uranquinty, The Rock, Milbrulong, Lockhart.)

Early Sowing—Zealand (for hay only), Bordan, Ford.
Mid-season Sowing—Dundee (for grain only), Baroota Wonder (for hay only), Bencubbin.

Zone 18: South-eastern Riverina.

(Yerong Creek, Henty, Pleasant Hills, Culcairn, Holbrook, Walbundry, Walla Walla, Gerogery, Jindera, Albury, Tumbarumba, Brocklesby, Balldale, Corowa.)

Early Sowing—Bordan, Ford.
Mid-season Sowing—Dundee (for grain only), Bencubbin.

Zone 19: North-central Riverina.

(Ganmain, Grong Grong, Narrandera, Darlington Point, Boree Creek, Urana.

Early Sowing—Ford.
Mid-season Sowing—Dundee (for grain only), Bencubbin.
Late Sowing—Gular.

Zone 20: South-central Riverina.

(Rand, Daysdale, Oaklands, Jerilderie, Berrigan, Finley, Tocumwal, Mulwala.)

Earl Sowing.—Ghurka (for grain only).
Mid-season Sowing—Ranee and Dundee (for grain only), Bencubbin.

Zone 21: Western Riverina.

(Deniliquin, Mathoura, Moama.)

Early Sowing—Ghurka (for grain only).
Mid-season Sowing—Ranee and Dundee (for grain only), Bencubbin.

Zone 22: Far Western Riverina.

(Moulamein, Balranald, Euston.)

Early Sowing—Ranee (for grain only), Bencubbin.

Zone 23: Murrumbidgee Irrigation Area (on irrigated areas).

Early Sowing—Bordan, Ford.
Mid-season Sowing—Waratah, Bencubbin.
Late Sowing—Waratah.

COASTAL DISTRICTS.

Early maturing varieties for hay or green fodder—Waratah, Florence.
Early Sowing only—Ford.

Notes on Recommended Wheat Varieties.

BRIEF notes on the foregoing recommended varieties are given hereunder as a guide to farmers in the choice of the best varieties of wheat for their conditions:—

Order of Sowing.

Early sowing—Ford type of wheat.
Mid-season sowing—Bencubbin type of wheat.
Later sowing—Gular type of wheat.

Baroota Wonder.—Essentially a hay wheat of excellent quality and acre yield for mid-season and later sowings. Farmers are strongly urged to sow the headlands of paddocks (which are usually cut for hay) with this variety. The growth is moderately tall, with slender, heavy weighing stems which cure to a desirable green colour. The leaves are moderately sparse, and generally free of disease troubles. The variety is slightly resistant to flag smut, but is susceptible to stem rust.

Bencubbin—A popular wheat of mid-season sowing, highly resistant to flag smut, and possessing only a moderate susceptibility to stem rust. On account of its tall growth and tendency to lodge, it should not be grown on over-rich soils or in districts of high rainfall, where Ford is a better variety. The grain bleaches fairly readily, and although classed as a weak flour wheat, it matures a bright grain of moderately good flour when grown within the lower rainfall districts. It is recommended for dry districts in place of Nabawa. The area sown to this variety has become excessively great, and its part replacement with medium strong varieties would ease some problems connected with flour blends and export shipments.

Bordan.—A variety lately recommended for early sowings within favoured rainfall districts. It is tall growing, moderately resistant to stem rust and flag smut, and the grain is of the medium strong flour class. In many respects Bordan resembles Ford, and is likely to replace it in districts of good rainfall, as it has a higher yielding capacity. It does not, however, finish quite as well should the late spring conditions be dry. As a hay wheat, it is not quite the equal of Ford in quality.

Dundee.—A productive variety for mid-season sowing; moderately short strong straw; moderately resistant to flag smut but very susceptible to stem rust and susceptible to frost damage. It is classed as a medium strong flour wheat, and under suitable dry ripening conditions produces a vitreous grain, but it frequently produces a mottled grain. Dundee is supplementary to Ford, possessing good gassing power.

Eureka.—A mid-season sowing wheat of medium height and fairly strong straw, highly resistant to stem rust, and moderately susceptible to flag smut. It produces a medium strong flour of high quality, and is suited to the conditions of North-western New South Wales. It is susceptible to Septoria leaf spot, but moderately resistant to flag smut.

Eureka 2.—A selection from Eureka from which it differs in being stronger in the straw and about a week later in maturity. It also holds grain well, which is not always the case with Eureka.

Both Eureka and Eureka 2 were highly resistant to stem rust prior to 1942-43, during which season in some areas their resistance broke down. Their reaction to stem rust in the future cannot, therefore, be predicted at present.

Fedweb 1.—A short, strong straw variety suited to early sowings, particularly within the North-western portion of New South Wales. It is highly resistant to stem rust, but susceptible to leaf rust, flag smut and Septoria. The grain, which is held firmly, is in the medium strong flour class and is of high quality.

Florence.—A wheat suited to late sowings, with tall, slender straw. Moderately resistant to flag smut and to stem rust. Highly resistant to bunt. The grain is very subject to shedding. It is generally hard and vitreous, with medium strong flour. Recommended only for green fodder and hay in coastal districts.

Ford.—A variety suited to early sowings within favoured rainfall areas. It is tall growing, possessing straw which picks up and combs well, or makes into good hay of good colour and quality; it is moderately resistant to stem rust and flag smut, and the grain is of the medium strong flour class; the flour, however, is slightly deficient in gassing power. Ford "finishes" better than most varieties even though the late spring may be dry, and the grain also appears to have a satisfactory resistance to bleaching. It is recommended for extensive sowings in all but the lower rainfall districts.

Ghurka.—A variety suited to early sowing within the Western Riverina, possessing very short strong straw. Resistant to flag smut and has some resistance to stem rust. Grain of weak flour strength.

Gular.—A wheat suitable for late sowing within favoured districts and for mid-season sowing within the drier districts. It is susceptible to flag smut and to stem rust. It is in the medium strong flour class. The grain is generally hard and vitreous, being but little inferior to Pusa 4 in baking quality, and therefore a high premium wheat.

Pusa 4.—A late sowing variety, with slender straw. Somewhat resistant to flag smut. Susceptible to stem rust. Grain generally hard, and in the strong flour class. On account of its relatively light yield it is suitable only for a few localities in northern districts.

Pusa 111.—A smooth-chaffed selection from Pusa 4, to which it is similar in all other characters.

Rance.—A mid-season sowing wheat, with short, fine but strong straw. Susceptible to flag smut and to stem rust. A weak flour wheat.

Waratah.—A tall-growing variety suited to mid-season sowing. The straw is slender, but picks up and combs well should the crop become lodged. It is susceptible to flag smut. The grain is of the weak flour class. Ripe crops are liable to shed. Most of the area previously sown to Waratah is now sown to Bencubbin.

Zealand.—A variety suited to early sowing and which produces high yields of hay of excellent quality in favourable districts. It is highly resistant to flag mut, but susceptible to stem rust. The straw is very tall, but stands fairly well. It is recommended only for hay.

Temporary Pastures in the Wheat Rotation.

J. N. WHITTET, H.D.A., Chief Agrostologist.

THE demand for increased quantities of animal products of all descriptions means that greater calls will be made on pasture and crop areas, and consequently, in addition to conducting good pasture management practices, an endeavour must be made to establish additional areas of sown pastures and grazing lucerne.

One major difficulty to contend with in this work is the fact that superphosphate, an essential in pasture establishment operations, is at present in short supply for use in inland farming and grazing areas, and the only alternative to sowing pastures and lucerne the most effective way, that is on well-worked fallows with 1 cwt. superphosphate per acre, will be to plant such species as Wimmera Rye, lucerne, and some of the clovers on at least a proportion of the wheat area to be sown next autumn, as under these conditions the grass and clover seedlings will have access to some fertilizer.

The seeding rate for wheat under these conditions should not exceed 45 lb. per acre (on soils which produce a rank growth use only 30 lb. per acre) in order to give the pasture plants a chance to become established and not be unduly crowded by the rapid growing cereal.

Should the spring be dry, the young pasture plants are likely to suffer, because the more robust rooting systems of the cereal plants will unfavourably compete with those of the pasture plants for soil moisture.

Where pasture seeding with a cereal is to be carried out, wheat is preferred to oats, as the latter crop crowds the pasture seedlings more than wheat plants do.

The recommendations for the various wheat zones are as follows:

Pasture Recommendations.

Wheat Zone No. 1.

Sow a mixture of Italian Rye 10 lb. and Red clover 4 lb. seed per acre; on heavy basaltic flats, add 2 lb. Black Medic (*Medicago lupulina*) seed to the mixture.

Wheat Zone No. 5.

Sow Wimmera Rye 1 lb., lucerne 2 lb., Subterranean clover (mid-season strain) 2 lb., Ball clover 1 lb., Barrel clover 1 lb., and Burr trefoil 1 lb. per acre on soils of good depth; where soils are shallow, omit the lucerne from the mixture and increase the Wimmera Rye to 3 lb. and the Ball and Barrel clovers and Burr trefoil to 2 lb. of each per acre.

Wheat Zone No. 13.

In the higher rainfall sections of this area Italian Rye 10 lb. and Red clover 4 lb. is a satisfactory mixture for a short term pasture of two years. Where a hardier mixture is required, plant Wimmera Rye 2 lb., Subterranean clover (mid-season strain) 3 lb., Ball clover 2 lb. per acre; on deep, well-drained soils add 1 lb. of lucerne seed to this mixture.

Wheat Zones Nos. 2, 3, 4, 6, 9, 10, 11, 12.

Where soils are friable and deep use a mixture of Wimmera Rye 1 lb., lucerne 2 lb. and Burr trefoil 2 lb. per acre; on the heavier types of country, unsuitable for lucerne, sow Wimmera Rye 3 lb. and Burr trefoil 4 lb. per acre. The lower rainfall sections of Zone No. 12 are too dry for lucerne and there the Wimmera Rye-Burr trefoil mixture should be planted.

Wheat Zones Nos. 6 *and* 14.

Plant Wimmera Rye 1 lb., lucerne 2 lb., Subterranean clover (mid-season strain) 2 lb. where soils are of good depth; on shallower country, use Wimmera Rye 3 lb. and Subterranean clover (mid-season strain) 3 lb. per acre.

Wheat Zones Nos. 8, 17 *and* 18.

In Zones Nos. 8 and 17 and the good rainfall sections of Zone No. 18, sow similar mixtures to those given for Zone No. 6; use Subterranean clover (early strain) 1 lb., and Barrel clover 1 lb., instead of Subterranean clover (mid-season strain), in the lower rainfall parts of Zones Nos. 17 and 18.

Wheat Zones Nos. 15, 19 *and the Eastern half of Zone No.* 20.

Use Wimmera Rye 1 lb., lucerne 2 lb., Subterranean clover (early strain) 2 lb., Ball clover 1 lb. and Barrel clover 1 lb. per acre on deep soil. In the case of shallow soils omit the lucerne and increase the Ball and Barrel clover seedings to 2 lb. each.

Wheat Zone No. 16 *and the Western half of Zone No.* 20.

Plant Wimmera Rye 1 lb., lucerne 2 lb., Ball clover 1 lb., Barrel clover 1 lb., Burr trefoil 1 lb. per acre on deep soils; for soils of poor depth use a mixture per acre of Wimmera Rye 3 lb., Ball and Barrel clovers and Burr trefoil 2 lb. of each. The lower rainfall sections of Zone No. 20 are too dry for lucerne.

Wheat Zones Nos. 21 *and* 22.

In these Zones sow Wimmera Rye 3 lb., and Burr trefoil 3 lb. per acre.

Irrigated Areas. (*A superphosphate ration is available for establishing pastures under irrigation.*)

The most satisfactory method of establishing pastures on irrigated country is to sow the grass and clover seeds mixture on a correctly graded and well prepared seed bed, and not with a crop of wheat.

Suitable temporary pasture mixtures for irrigated country would be:—

A. Where the amount of water is limited in quantity:—Wimmera Rye 2 lb., lucerne 2 lb., and Subterranean clover (mid-season strain) 2 lb. per acre.

B. In areas where the water supplies are plentiful:—Italian Rye 2 lb., Wimmera Rye 2 lb., Perennial Rye 4 lb., Red clover

2 lb., Subterranean clover (mid-season strain) 2 lb., lucerne 2 lb. per acre. On shallow soils having impervious subsoils close to the surface, omit lucerne from the mixture.

General Notes.

Owing to the large amount of "hard" seed in Ball and Burr clovers, only scarified seed of these species should be planted.

One of the disadvantages of sowing lucerne with wheat, is that if the spring and early summer months turn in very dry, this legume is unlikely to become established satisfactorily when sown with a clover crop.

In heavier rainfall districts other grasses and clovers, such as *Phalaris tuberosa*, Perennial Rye, White clover, are suitable for the establishment of permanent pastures; these species, however, are too valuable to include in the wheat rotation as they would be approaching their maximum carrying capacity when wheat was to be planted again.

Any farmer requiring details of suitable permanent pasture mixtures for his country should write to this Department for recommendations.

Further details covering pasture improvement operations will be found in the following publications which can be obtained, free of cost, from the Department of Agriculture, Sydney:—

Pasture Improvement in Northern Tableland Districts.

Pasture Improvement in Central and Southern Tableland Districts.

Pasture Improvement in the Slopes, Plains and Western Division.

Lucerne as Pasture in Western Districts.

Methods of Establishing Improved Pastures.

Methods and Machinery for Top-dressing Pastures.

Pasture Management.

Pasture Improvement on the Murrumbidgee Irrigation Area.

Oats and Barley Recommendations.

ONE of the essentials to success in the growing of the winter cereals, oats and barley, is to sow varieties suited to the climatic and soil conditions.

The following are the recommendations of the Department of Agriculture for the 1944 sowing season for different districts and purposes:—

OATS.

North Coast.

For early green fodder—Sunrise, Buddah.
For grazing—Fulghum, Algerian.

South Coast.

For early green fodder—Belar, Sunrise, Mulga, Buddah.
For grazing—Algerian, Fulghum.
For late green fodder—Algerian.

Northern Tableland.

For grain, hay, or grazing (autumn sowing)—Algerian.
For grain or hay (autumn sowing)—Lampton.
For grazing only (autumn sowing)—Fulghum.
For grain or hay (spring sowing)—White Tartarian, Lampton.

Central Tableland.

For grain, hay or grazing (autumn sowing)—Algerian.
For grain or hay (autumn sowing)—Lampton.
For grazing only (autumn sowing)—Fulghum.
For grain or hay (spring sowing)—White Tartarian, Lampton.

Southern Tableland.

For grain, hay or grazing (autumn sowing)—Algerian.
For grain or hay (autumn sowing)—Lampton.
For grazing only (autumn sowing)—Fulghum.
For grain or hay in coldest parts (spring sowing)—White Tartarian, Lampton.

North-western Slopes and Upper Hunter.

For grain, hay or silage—Algerian, Belar, Burke, Mulga, Buddah.
For grazing—Algerian, Burke, Fulghum.

Central-western Slopes.

For grain, hay or silage—Algerian, Belar, Burke.
For grain, hay or silage in drier parts—Gidgee
For grazing—Algerian, Burke, Fulghum.

South-western Slopes and Eastern Riverina.

For grain, hay or silage—Algerian, Belar, Burke.
For grazing—Algerian, Burke, Fulghum.

Western Plains and Western Riverina.

For grain, hay or silage—Belar, Burke, Gidgee, Mulga.
For grazing—Burke, Fulghum.

Murrumbidgee Irrigation Area.

For grain, hay or silage—Algerian, Belar, Burke.
For grazing—Algerian, Burke, Fulghum.

BARLEY.

Recommended Varieties.

The varieties of barley recommended by the Department are:—

Malting or two-row type—Pryor.
Feed or six-row type—Trabut (for green fodder or grain).

War Secrets Spread Like a Bush Fire. Don't Gossip.

Approved Seed—December, 1943.

To assist in the production and distribution of approved seed of recommended varieties of crops and vegetables, the Department publishes in this list each month the names and addresses of growers of such seed. For this service a charge of 2s. 6d. is made for each insertion of each variety listed. The number of varieties listed on behalf of each grower will be restricted to twenty-five for the time being. The Department may inspect the crop producing the seed, and in all cases a sample of the seed must be sent to the Department of Agriculture with information as to the location of its production, and must be accompanied by the fee indicated above.

If any seed producer does not wish to pay the advertising charge he may submit his name with the variety of seed and sample to the Department, and if it is approved his name will be listed in the Department and information will be supplied regarding it to inquirers.

Maize.—
Fitzroy—Manager, Experiment Farm, Grafton (10s. per bus. f.o.r. Grafton).

Broom Millet.—
Manager, Experiment Farm, Bathurst. (6d. per lb.).

Tomatoes.—
Potentate—Rumseys Pty. Ltd., Church-street, Parramatta.

Cauliflower.—
Shorts—H. Burton Bradley, Sherwood Farm, Moorland.
All-the-year-round—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Parsnip.—
Yates' Hollow Crown—Arthur Yates & Co. Pty. 184 Sussex-street, Sydney.

Garden Peas.—
Greenfeast — Mr. S. Lee Archer, "Ebenezer," Tumorrama, via Tumut.

Beet.—
Yates' Derwent Globe—Arthur Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.

Cabbage.—
Yates' Vanguard—Arthur Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.
Yates' Derwent Re-selected Early Drumhead—Arthur Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.

Cucumber.—
Early Fortune—Arthur Yates & Co. Pty., Ltd., 184 Sussex-street, Sydney.

Pumpkin.—
Yates' Re-selected Queensland Blue — Arthur Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.
Yates' Re-selected Triamble—Arthur Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.

Swede.—
Yates' Champion Purple Top—Arthur Yates & Co. Pty. Ltd., 184 Sussex-street, Sydney.

Varieties of Approved Seed Available.

IN order that farmers may be directed to what are regarded by the Department as the most satisfactory local sources of approved seed of recommended commercial varieties of farm crops and vegetables, the Department is willing to supply information concerning such sources of seed of the following varieties:—

Maize.—
Golden Superb, Golden Nugget, Golden Beauty and Leaming.

Grasses, etc.—
Phalaris tuberosa, Subterranean Clover (mid-season), Sheep's Burnet, Lucerne, Sudan.

To Assist Fodder Conservation.

(*Continued from page* 537.)

Since 1924 a concession rate of 1 1/10d. per ton per mile has existed in regard to the carriage of materials used for the building of silos, subject to a minimum charge of the "Miscellaneous" class rate per ton for ten miles, and also subject to stipulated minimum weights per truck. These particulars are set out in the current issue of the Merchandise and Livestock Rates Book (p. 143).

These concessions were never availed of, apparently because of the difficulty of complying with the conditions associated therewith.

The Commissioner for Railways has now agreed to reduce the rate on silo materials to 1d. per ton per mile, though still subject to the minimum weights per truck previously stipulated. Provision, however, is made for alternative rates for the carriage of smaller quantities as under:

	Rate.
Subject to minima of 10 tons per K, KH, or U trucks and 8 tons per 4-wheeled trucks for other vehicles	"M" Class
Smaller quantities, actual weight, subject to the minimum freight charges	"A" Class

These same concessions have been extended to materials for the erection of sheds for the storage of fodder in anticipation of adverse seasons, and to wire netting to be used for the protection of crops being grown for conservation.

The ordinary rates are to be charged in the first place and the allowance made by rebate, subject to satisfactory evidence being furnished that the materials have been used for the purposes to which the concessions are applicable. Applications for the reduction must be made within three months of the date the consignments are forwarded.

THE GRAIN SORGHUMS.

Value of New Varieties Demonstrated.

W. D. KERLE, H.D.A., Special Agricultural Instructor.

EXPERIMENTS conducted in a number of districts prior to the war gave striking evidence of the suitability of the newer varieties of grain sorghums for marginal maize areas and in inland irrigation districts of New South Wales. These varieties have shown their adaptability to the better summer rainfall areas such as the north-west in particular, and their acreage there is extending rapidly. They must eventually play a most important part in this State's agriculture; the crop is easy and cheap to grow and to harvest, provides valuable late autumn and early winter grazing, nutritious grain for all classes of stock, and a cheap source from which to conserve grain for supplementary or drought feeding.

The term grain sorghum is applied to types of the sorghum group grown primarily for grain, as distinct from the forage sorghums, such as Saccaline and White African, which are classed as saccharine because the stalks are juicy and sweet. The grain sorghums, of which Wheatland Milo, Kalo and Texas Blackhull Kaffir are typical, are classed as non-saccharine (stalks dry or slightly juicy and not sweet). One frequently hears all grain sorghums referred to as "Milo" which is misleading, since this name applies only to one group; the same confusion exists in regard to the sweet sorghums which are frequently called Saccaline—the name of one variety of the group.

Some years ago grain sorghums were grown to some extent in New South Wales, but although they showed promise, their cultivation was not generally adopted. During recent years the value of the new variety types has been demonstrated in Queensland, to which State they had been imported from the United States of America.

In America the grain sorghum crop is a most important one; it is, in fact, the sixth most important cereal crop, and some 100 million bushels of grain are harvested annually, the leading state being Texas with an acreage of 3,700,000 acres. Many varieties are grown, the best types having been developed by careful selection and testing for some years, and more recently by hybridisation. The latter has resulted, particularly, in dwarf types more suited to harvesting by modern machinery and to types of better grain quality and resistant to disease. It was chiefly these types which were introduced into this State in 1940 and which have shown their superiority over those introduced earlier.

Climate and Soil.

The grain sorghums require a frost-free period of about five months, and are particularly adapted to areas where the average annual rainfall is 18 to 25 inches provided the seasonal fall covering the growing period, of six months, is not less than 14 inches. They are, therefore, more drought-resistant than maize or fodder sorghums and

Hegari Grain Sorghum in Head at Yanco.

most suitable for districts where summer rainfall is normally experienced and where maize is a risky crop to grow.

They grow best in warm climates, being of tropical origin, and require a warm seed bed to ensure good germination and seedling growth. Grain sorghum will withstand extreme heat better than other cereal grain crops, although better yields are obtained if heading does not take place in extreme heat. They will produce grain with a limited supply of moisture but, although resistant to drought, in extreme droughts will fail to produce a crop. Grain sorghums will also grow well in districts of abundant rainfall, but wet weather frequently causes mould in the heads and maize is definitely safer and more profitable under these conditions.

The grain sorghums will grow satisfactorily on most classes of soil, but in dry seasons do best on sandy loams. The plant suffers considerably on heavy clay soils in dry seasons, but if the weather is favourable will yield well in these soils also.

Soil Preparation and Sowing.

The soil should be well prepared for grain sorghum. The success of the crop depends a great deal on conserving moisture in the soil prior to sowing, and this is associated with early preparation and working after rain. A good seed bed is essential in securing a good stand and in controlling early weed growth. It is advisable to kill several crops of young weeds by harrowing prior to sowing to avoid more costly cultivations after the crop is up. The plough is preferable for the initial preparation of land, the subsequent workings being done with the harrow or rigid tyne cultivator.

Sowing may be done on the flat or in furrows. It is best to use a double-row planter with furrow openers, as the seed is placed directly in moist soil. The furrows should be about 4 inches deep. Other advantages of furrow sowing are better control of weed growth and the encouragement of deeper rooting. The quickest method in wheat districts is to sow through the seed box of the combine or drill, sowing through every fifth or sixth run. If the drill is set to sow about 30 lb. of wheat, the crop should be the desired thickness, but as there is considerable variation in size of grain and in drills it should be tested beforehand. With maize planters the ordinary sorghum plates should be used.

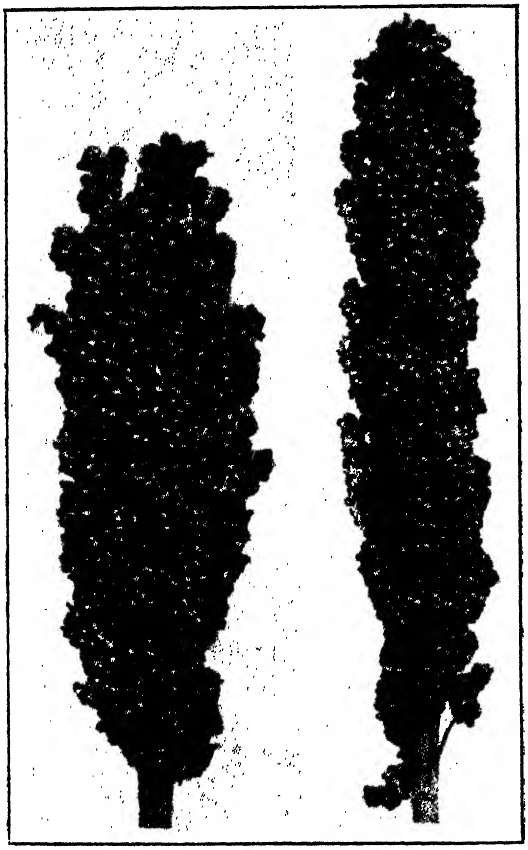
The thickness of the stand is important with grain sorghums, and the most satisfactory rate of sowing depends on the variety, the condition of the soil and time of planting. The Milos, for example, sucker freely and appear to have the ability to regulate the number and size of heads according to the moisture and space available. Thinner planting is therefore required with these varieties than the Kaffir or intermediate types; a plant every 12 inches in the row with Milo and 6 inches with the Kaffirs, is recommended. This will require from 2-3 lb. of seed per acre for the former and 4-5 lb. for the latter. The drier the district the thinner the stand should be, and if sown in furrows before the ground is well warmed up, more seed should be used.

Day Milo Grain Sorghum.

Grown at Mt. Russell, Inverell.

Depth and Time of Sowing.

The seed should be covered to a depth of 1 to 2 inches of soil when sowing, but this will depend on the moisture available. It is not advisable to plant in dry soil. Grain sorghums may be sown as soon as danger from frosts is over and the soil is warmed



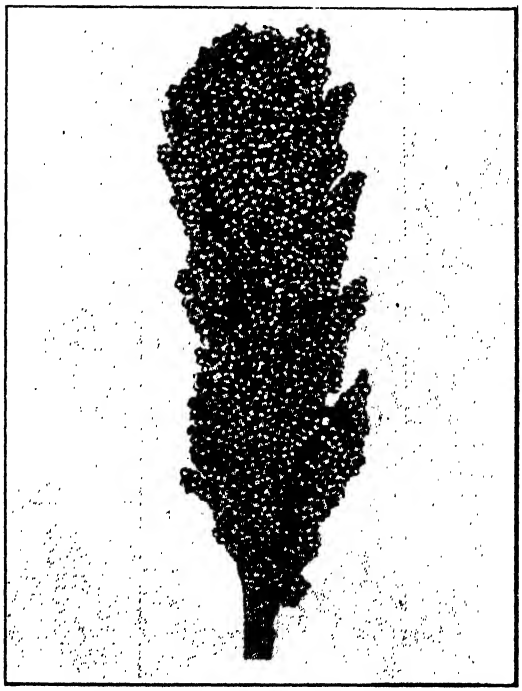
Heads of Grain Sorghum Varieties.
Left.—Wheatland Milo. *Right.*—Kalo.

up. If the crop is grown with the intention of harvesting with the wheat header it should be sown no later than about the end of November as the heads will thresh out much better in dry, warm weather. Some consideration should be given also to sowing at a time which will avoid heading at the driest and hottest period of the summer. This stage is reached about seven to eight weeks after sowing but is influenced by weather conditions. Grain sorghum which is to be fed off in the paddock should be sown in November or December, according to the length of the frost-free period of the district, as this will fit in better with late autumn and early winter utilization, when feed is scarce.

Seed Purity and Treatment.

Grain sorghums cross readily, and it is difficult to secure pure seed. Seed should be procured from a reliable source and one variety only should be sown and isolated from fodder sorghums, Sudan grass and broom millet. Short-growing types, such as the Milos, which are to be header harvested must be pure, as uneven heading will cause trouble. The establishment of a small area in isolation, for seed purposes, to be "rogued" as soon as impurities appear and from which seed heads can be selected, is strongly recommended. It takes very few such heads to sow an acre.

There is considerable risk in importing noxious weed seeds in grain sorghum from unreliable sources.



Texas Blackhull Kaffir Grain Sorghum.

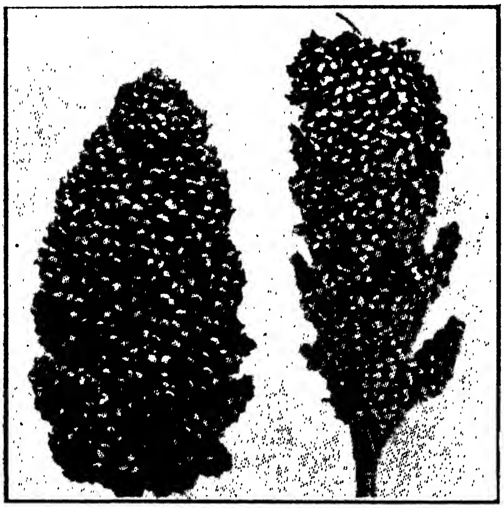
Treatment of the seed for kernel smut is essential, unless it has definitely been secured from a clean crop. Some very badly affected crops have already been in evidence. Treatment consists of treating the seed with ceresan or agrosan dust at the rate of 2 oz. per bushel, the cost of the treatment being less than 3d. an acre.

After Cultivation.

The operations necessary for keeping grain sorghums free of weeds and the soil mulched, are the same as for maize. Harrowing when the crop is 5 or 6 inches high will save cleaning between the rows later. The frequency of cultivations between the rows will depend on weed growth; the aim should be to keep weeds well in hand, as much growth will rob the soil of moisture which would perhaps make all the difference between success and failure in the late stages of growth.

Fertilisers.

In most districts where wheat or maize respond to artificial fertilisers, the grain sorghums should be given an application of superphosphate at the rate of 1 cwt. per acre. The effect of the superphosphate is to develop stronger root growth and thus increase the foraging power of the plant for moisture.



Grain Sorghum Heads.
Left.—Day Milo. *Right.*—Feterita.

Irrigation.

Grain sorghums produce heavily on our inland irrigation areas, and compared with other crops they are very economical of water. Land that is intended for grain sorghums to be irrigated should be flooded just prior to sowing. After the crop is established it should be irrigated often enough to maintain a good supply of soil moisture—probably three waterings would be sufficient. The stand can be thicker where the crop is to be irrigated and 5 to 6 lb. of seed to the acre can be used. Difficulty may be experienced in harvesting owing to a high percentage of moisture in the leaves, stalk and seed. Thin stands and abundant soil moisture aggravate this trouble, while, on the other hand, if the stand is too thick and insufficient water is applied, the plants will "burn" and yield badly. Early planting and reasonably thick stands, with adequate irrigation during the early stages of growth and no irrigation after the heads appear are recommended. These methods will produce a more even crop as regards moisture in grain and stalk when mature, and facilitate harvesting. This is the method practised in California with considerable success.

Varieties.

Very few varieties of grain sorghum are as yet available in this State. Those introduced in 1940 were Wheatland Milo, Day Milo, Kalo, Hegari and Texas Blackhull Kaffir. The only variety available here at that time was Feterita. Of these new varieties, Wheatland Milo and Kalo have given the best results, but all proved satisfactory.

The following are brief descriptions of the varieties:—

Wheatland Milo.—A variety of the Milo group of which there are many varieties in the United States of America. It is a cross between Milo and Kaffir. The stalks are short, 2½ to 3½ feet in height, sturdy and non-saccharine, and the variety suckers freely; each plant may produce two to five tillers and heads of uniform height. The heads are elongated, cylindrical, somewhat open and varying in length from 6 to 9 inches, depending on thickness of stand and the season. The seed is of fairly large size, and of a dull brown colour. The glumes are black and hold the grain firmly, preventing shattering. Wheatland Milo matures in approximately 110 days. It is particularly well adopted for header harvesting and has yielded well in the north-west.

Kalo.—Kalo is a selection from Early Kalo, also a cross between a Milo and a Kaffir. It grows to a height of 3½ to 4½ feet, has slender stalks which are slightly juicy and a fair amount of leaf. The heads are cylindrical and 9 to 10 inches long. Kalo has about the same maturity as Wheatland Milo, but the grain is much smaller and is of a reddish-brown colour. Kalo does not sucker as freely as Milo, and can be very

(*Continued on page* 553.)

INSECT PESTS.

Notes contributed by the Entomological branch.

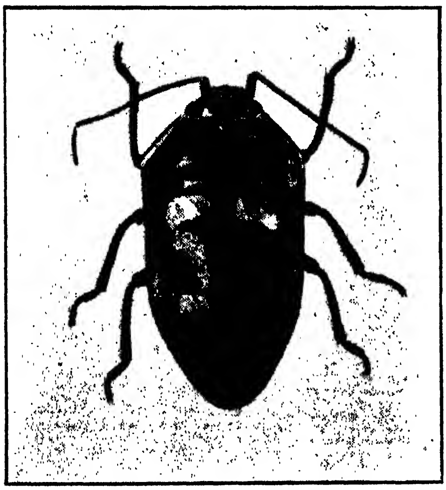
PLANT BUGS.

(*Hemiptera.*)

FOUR native species of plant bugs that at times occur in sufficient numbers to cause damage to cultivated plants are the metallic shield bug (*Scutiphora pedicellata*), the so-called cotton plant bug (*Dysdercus sidae*), the harlequin bug (*Dindymus versicolor*), and the crusader bug (*Mictis profana*). Occasionally, the hore-hound bug (*Agonoscelis rutila*) also occurs in swarms.

During the present season, the harlequin bug, the cotton plant bug and the crusader bug have been abundant amongst cultivated plants in various districts.

These bugs feed by piercing the plant tissues and sucking up the sap, and normally they develop on native trees and shrubs, and on various weeds. They grow by a series of moults, until the winged adult stage



The Metallic Shield Bug.
(Twice natural size.)

is reached, and at times may be found swarming in great numbers on tree trunks and fence posts and also in sheds, etc.

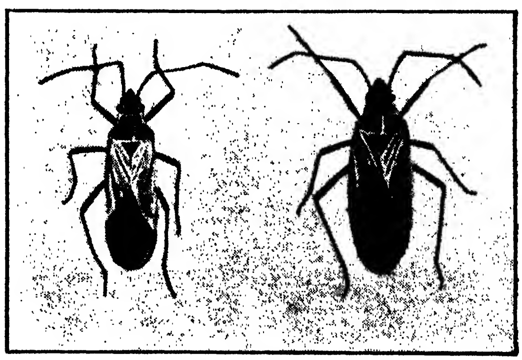
The Metallic Shield Bug.

This bug may attack various cultivated fruits including peaches, cherries, grapes, etc. It has been observed swarming over native fig trees (*Ficus* sp.) and feeding on the fruits, and has also been found in numbers on tea-tree (*Melaleuca* sp.). Many varieties of garden plants may be attacked.

The adult bug is a shield-shaped insect which measures slightly more than ½ inch in length and is a deep metallic-green or blue, mottled with black, on the upper surface. The front and side margins of the thorax and two spots behind the pro-thorax are bright red. The under surface is bright red with a row of small, bright, metallic green or blue markings along each side of the thorax and abdomen.

The Cotton Plant Bug.

This bug is a member of a genus, the various species of which, in some countries, are referred to as "cotton stainers," on



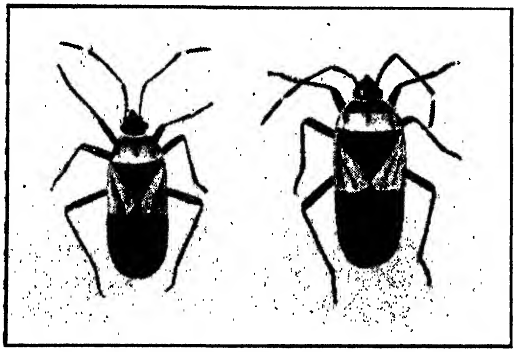
The Cotton Plant Bug.
(Twice natural size.)

account of the damage they cause to cotton crops. In this State, this bug may attack various fruit trees and garden plants.

The adult, which measures about ½ inch in length, is of a general light reddish-brown colour above, with the ends of the thickened wing-covers (hemelytra) dark brown. Near the centre of each wing-cover there is a small black spot. There is also a small, black, triangular marking in the centre of the back (the scutellum) and a black mark on both the front of the thorax and head. The undersurface is yellow to greenish with several black markings.

The Harlequin Bug.

In New South Wales this bug has been recorded attacking a very wide range of host plants, including, amongst cultivated plants, apple, fig, orange, grape, rhubarb, melon, pumpkin, tomato, dahlia, violet, etc.



The Harlequin Bug.
(Twice natural size.)

The adult, which measures about ½ inch in length, is broader than the cotton plant bug. The head and both the inner margins of the forewings and their tips are black; the thorax and base of the forewings are reddish-orange. The undersurface of the body is tinged with yellow or green, and bears some red and black markings.

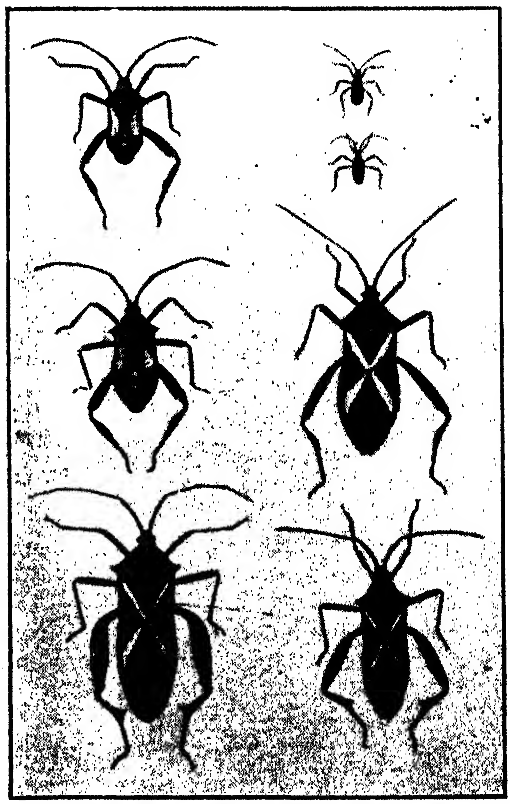
The Crusader Bug.

The preferred native host plants of this bug appear to be various species of wattles, cassias and eucalypts. It has been found attacking fruit trees and various cultivated garden plants, including citrus, grape, rose, cassia, acacia, wistaria, etc.

When infesting citrus the bugs usually feed on the young shoots a few inches below the tips, thus checking the growth and causing the young wood to become "scorched" and often to die back to the old wood.

The adult bug, which measures slightly less than 1 inch in length, is of a general dark brown or greyish-brown colour, and flies readily if disturbed. On the centre of its back is a well-defined, yellow, "St. Andrew's" cross, and it is from this marking that the bug takes its popular name of "crusader" or "holy" bug. The under surface of the body, the legs and antennae are brown, but in some individuals the tips of the antennae are orange. The hind legs of the males are thickened, and there is a sharp angular projection at about the middle of each hind tibia.

The eggs are relatively large, elongated, and brown with a rounded lid or operculum through which the young bug emerges, at one end. These eggs are often laid in rows upon the foliage of the host plants, but may sometimes be deposited among debris, etc., on the ground.



The Crusader Bug.
(Actual size.)

The first stage bug is brown with a reddish-coloured abdomen. The half-grown bug is brown, and has two small orange spots in the middle of the upper surface of the abdomen; the developing wings or "wingbuds" are also marked with orange, and there is a narrow orange line on each side of the abdomen.

The Hore-hound Bug.

This bug is usually found infesting horehound (*Marrubium* sp.), but in some seasons it occurs in swarms on fruit-tree foliage and blossoms and on cultivated ornamental plants. Although some damage to garden plants has been reported, and dropping of citrus blossoms is believed to have been due to infestation by this bug, it does not usully appear to cause any appreciable injury.

The adult bug, which measures about ½ inch in length, is a shield-shaped insect, and is bright orange-red marked with black, on both the upper and lower surfaces of the body, and from its colour it is sometimes called the red and black shield bug.

Control.

Control of adult bugs is difficult and there is no insecticide at present available which may safely be used to destroy them on the plants.

Where only a few plants are infested, hand-picking of the bugs may be resorted to, and this will be sufficient to ensure satisfactory control.

Dusting with 2½ per cent. nicotine dust will repel the bugs, and the residue of lime, although unsightly, acts as a deterrent.

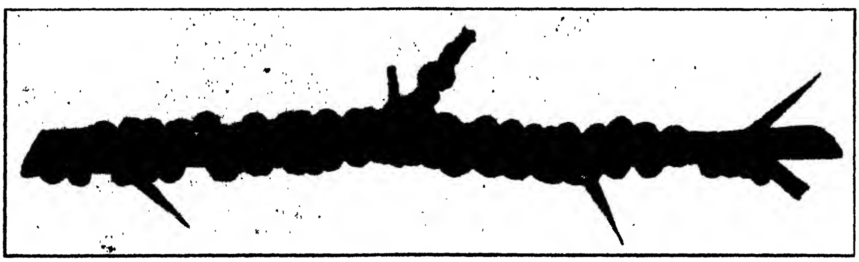
Spraying with a kerosene-pyrethrum emulsion is effective, but pyrethrum is not obtainable at the present time.

The Brown Scale.

(*Saissetia oleae.*)

THE brown scale, which is an almost cosmopolitan insect, occurs over the greater part of New South Wales, and infests a wide range of plants including passion vines, olives, citrus, and many different kinds of garden shrubs.

Although the scales may infest various parts of the plants, the twigs and stems are preferred. The insects possess sucking beaks, and feed by puncturing the plant tissues and extracting the sap from their host plants, and thus, when abundant may weaken the whole plant. In addition, they excrete quantities of "honey dew," a sugary secretion which adheres to the foliage or stems upon which it falls, and in this a sooty mould develops and makes the plants unsightly.



The Brown Scale.

The adult female scales are dark brown to almost black, hemispherical in form, and measure about ⅛ inch or more in diameter. They frequently have two short transverse ridges and a central ridge, on top of the scale covering which form a raised, H-shaped figure. The male scales are narrow and flat and are not readily seen.

The eggs are laid beneath the body of the scale, and as many as 2,000 may be laid by an individual female. The young larvae, on hatching, are minute, six-legged insects, and are sometimes referred to as "crawlers." They remain beneath the parent scale for a day or two, and then crawl actively about before finally settling permanently for the remainder of their lives. The larvae measure about 1/50 inch in length and are slightly pink in colour.

The first moult of the female occurs from about four to six weeks after hatching, and the second (bringing it to the adult stage) from two and a half to three months after birth. The male passes through an additional stage—the pupal stage—and unlike the female, which remains attached to the twig throughout life, emerges from its scale covering as a minute two-winged insect.

The egg-laying period extends over several months and all stages of the insect may be found at nearly any time of the year. In the coastal areas of this State there is more than one generation a year.

Control.

Control of this scale may be obtained by spraying with a white oil emulsion or by fumigation with hydrocyanic acid gas.

The white oil emulsion is diluted at the rate of 1 gallon of oil in 40 gallons of water (4 fluid oz. to 1 gal.). Where citrus trees in coastal areas are infested, the most suitable time to apply the spray is during December and early January, when the majority of the scales on the trees are in their immature stages, and are more readily killed. In coastal areas, other scales may be present on citrus trees, in association with the brown scale, and the application of an oil spray at the period mentioned will also give control of white wax scales, if the hatching of these scales has been early and even. Light infestations of red scale may be held in check by such early spraying, but where red scale infestation is heavy, it will be necessary to apply an oil spray later in February.

Where garden shrubs or ornamental trees are infested, a careful watch should be kept to determine when the majority of the scales are in their immature stages so that the treatment may then be undertaken.

In some localities, various species of wasp parasites attack and destroy considerable numbers of the scales and at times render artificial control measures unnecessary.

The Soft Brown Scale.

(*Coccus hesperidum.*)

THIS scale is a cosmopolitan species found in tropical and subtropical regions, and in greenhouses, etc., in the colder climates. It infests a great variety of plants, amongst which are banana, citrus, grape, fig, passion vine, peach, pear, palm, ferns, oleander, etc.

The Soft Brown Scale.

These scales are usually more numerous about the mid-ribs and main veins of the leaves. They feed by sucking the sap from the plant tissues and excrete quantities of "honey dew," which is attractive to ants and in which a sooty mould develops.

The mature female, which may measure from about 1/10 to 1/5 inch in length, is usually oblong-oval in outline, and narrower in front, but many individuals are irregular in outline. It is soft-bodied, flattened and slightly convex above, and varies in colour from yellowish to brownish, but is sometimes tinged with green, and is often mottled on the upper surface with a darker brown.

Living young are produced, and these crawl from beneath the parent scale, and later commence to settle on other parts of the plants. These young larvae or "crawlers," which measure about 1/50 inch in length, are oval in outline, and yellowish in colour. Several generations occur during the year, and individuals in various stages of development are to be found at almost any period.

Control.

Control of this scale may be obtained by spraying with a white oil emulsion diluted at the rate of 1 gallon of oil in 40 gallons of water (4 fluid oz. to 1 gal.), or by fumigation with hydrocyanic acid gas.

In some localities various species of wasp parasites assist in reducing the numbers of the soft brown scale.

Metallic-green Flies.

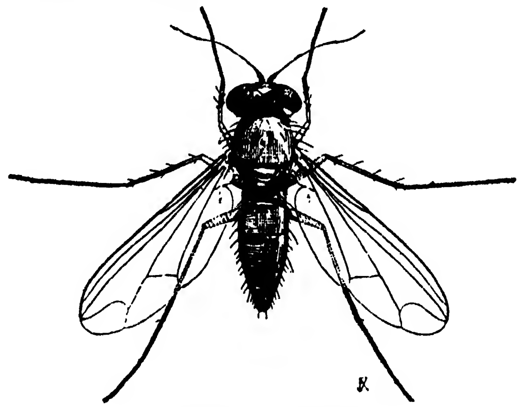
(*Dolichopodidae.*)

During the present season these flies have been numerous, and numbers of enquiries have been received from growers concerning their identity.

They are generally observed running actively over, or alighting on, the leaves of various plants. The adults, which measure about ¼ inch in length, are narrow-bodied, and are usually seen standing high on their long, slender legs. The most frequently noticed species are of bright metallic-green, blue or bronze colouration.

The adults are carnivorous, and feed upon minute, soft-bodied insects, etc., which they envelop with their soft, fleshy proboscis, while extracting the body fluids of their victims.

The larvae or maggots of members of this family of flies live beneath the ground, among humus, or in rotten wood. Several species are known to prey upon the larvae and pupae of wood-boring beetles, and others are aquatic.



A Metallic-Green Fly.
[*After William* .

Grain Sorghum.

(*Continued from page* 548.)

satisfactorily harvested with the header. It has given excellent yields in the north-west and on the Murrumbidgee Irrigation Area.

Hegari.—An intermediate type between Kaffir and Feterita. It grows in height from 4 to 5½ feet and tillers freely. The heads are cylindrical in shape, 7 to 8 inches long and the grain is about the size of Kalo and chalky white in colour. Hegari is not so hardy as other varieties and does best under irrigation. The stalks are slender, juicy and rather leafy and are the most palatable of all grain varieties. Hegari is regarded as a good variety for grazing with sheep and matures in approximately 115 days.

Texas Blackhull Kaffir.—This variety is characteristic of the Kaffir type and grows to a height of 5 to 6 feet; it ripens in about 120 days. The stalks are stout, short-jointed and juicy, the leaves stiff and abundant. The heads are cylindrical or oblong, 8 to 12 inches in length and fairly compact. The seed is medium sized, oval shaped and white in colour; the black glumes cover one-third or more of the grain. This variety did very well in the Murrumbidgee Irrigation Area and particularly well on the granite soil in the Bathurst District. It will not stand up to dry conditions as well as the Milos.

Feterita.—There are a number of varieties in this group, which is characterised by dry stalks, compact erect head and large, chalky white seed. The stalks are 6-8 feet in height, carry less leaf than the Kaffirs or Milos, but sucker less than the latter. The Feteritas are early maturing and drought resistant, and are in favour in Queensland for grazing off with sheep. Standard Feterita was grown in this State some years ago, and, although it showed promise, did not come into general use. The newer and shorter-growing types appear more suited to our conditions.

Day Milo.—This is a short growing variety of the Milo group, and is very satisfactory for header harvesting. It is similar in growth and characteristics to Wheatland Milo, but the grain is of bright and more attractive appearance. It is drought resistant and also does well under irrigation, as evidenced by recent trials on the Murrumbidgee Irrigation Area.

(*To be concluded.*)

Rough-bearded Grasses.

(*Echinopogon* spp.)

A Key to Their Identification.

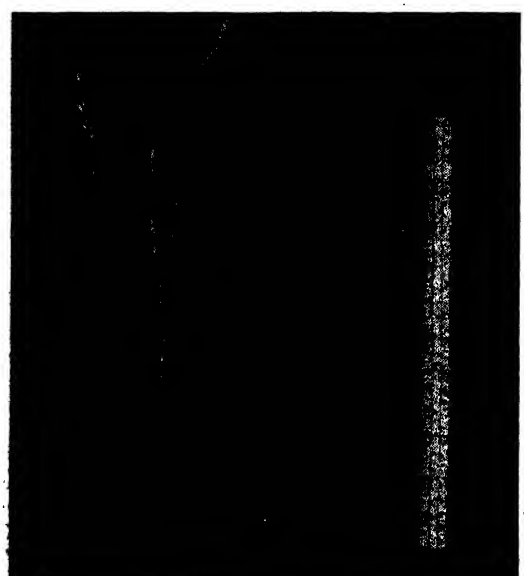
D. O. CROSS, B.Sc.Agr., D.P.A., H.D.A., Botanist, National Herbarium of New South Wales.

THE chief interest of graziers in the Rough-bearded Grasses (*Echinopogon* spp.), is their reputed toxic properties when eaten by stock. Until further detailed tests are carried out with the different species it will not be possible to say which ones, if any, are harmless. For the present it would seem safer to regard all species as potentially toxic.

Although the publication of Hubbard's research in 1935 established the existence of a number of distinct species in Australia, whereas previously it was considered that there was only one, the only feeding tests recorded refer in general terms to the species (*Echinopogon ovatus*). This is now known to be one of the less common species, usually found in damp places or under semi-shade conditions, and therefore not commonly grazed by stock.

Records in the New South Wales National Herbarium show that we have seven well defined species in New South Wales, of which the commonest is *Echinopogon caespitosus*. These grasses are native to Australia and New Zealand, and although found chiefly on the coast and tablelands of New South Wales, they are most abundant on the New England Tablelands.

The possession of poisonous properties by Australian grasses is unusual, and it is desirable that graziers and farmers should be able to recognise any grass or group of grasses possessing these undesirable qualities. It is to enable identification of the species of *Echinopogon* which occur in New South Wales that the following information and descriptions have been prepared. Should any grower suspect that he has some of these grasses on his property and be unable to identify them, he should forward specimens of complete plants for determination to the Chief Botanist, National Herbarium of New South Wales, Botanical Gardens, Sydney.



Dried Specimen of *Echinopogon caespitosa*.
(Tufted Rough-bearded Grass.)
The commonest species in New South Wales.
[*D in accompanying drawing.*]

Description.

It is not proposed to give detailed descriptions of each of the species of *Echinopogon*, but the following characters are general to them all:—

The flowering head is a more or less compacted, spike-like panicle with the spikelets (so called "seeds") usually one-flowered (and hence one-seeded), rounded in section with approximately equal glumes, and usually an awn or bristle which may be either very short or conspicuously long. The rachilla or small stalk of the spikelets is articulated above the outer glumes, so that the inner glumes (*lemma* and *palea*) together with the grain, fall away at maturity, leaving the outer glumes attached to the head. The rachilla is also produced beyond the

A. B. C.

E. F. G.

Dried Specimens of Other New South Wales Species of *Echinopogon*.

A.—*E. McKiei* (McKie's Rough-bearded Grass). B.—*E. phleoides* (Slender Rough-bearded Grass).
C.—*E. ovatus* (Forest Rough-buarded Grass). E.—*E. intermedius* (Coarse Rough-bearded Grass).
F.—*E. futans* var. *major* (Nodding Rough-bearded Grass) G.—*E. Cheelii* (Cheel's Rough-bearded Grass).

[*Photos. by courtesy of Biological Branch.*

inner glumes into a minute, elongated bristle. The outer glumes are usually produced into fine points. The prominent inner glume (lemma) bears the awn and often has a two-pointed tip. It becomes tough at maturity.

In general, all species are tough, harsh, erect grasses with flat leaves, the leaves and stems being usually covered with hairs set downwards and backwards. In most species these hairs are very noticeable just below the head, giving a very raspy or rough feel, hence the name "Rough-bearded Grass."

Poisonous Properties.

Hurst (1942), records the following about the toxic properties of these grasses:—

"A form of 'staggers' is produced in stock when the grasses are eaten, and it is quite distinct from that produced by *Malva parviflora* [Marsh Mallow], *Stachys arvensis* [Stagger Weed] and *Lamium amplexicaule* [Dead Nettle].

SYMPTOMS.

"Symptoms as described in the reports of Henry and Massey (1911) are stiffness of the hindquarters, inco-ordination of movements, so that at times, especially if made to run, the animal falls in convulsions, the legs stiffen and it appears to be in pain. Breathing is rapid, the animal sweats, the head is continually shaken up and down and there is some tympanitis. The disease appears to be of a lingering nature, and may assume a chronic aspect, in which case the animal becomes emaciated, the appetite is impaired and it walks stiffly. Post mortem examination shows the carcases to be fairly well nourished, but somewhat anaemic. There may be slight congestion of the meninges. All classes of animals appear to be susceptible.

"Seddon and Carne (1926) state that the disease is most prevalent in late winter and early spring, at which time the *Echinopogon* is more plentiful than at other seasons; other grasses having then been eaten down, stock are forced to seat the *Echinopogon* which is then making rapid growth. Stockowners consider that 'staggers' due to *Echinopogon* is worst in the spring when this grass is young and shooting. The authors state, however, that 1 lb. of the plant, fed late in the season, produced typical symptoms.

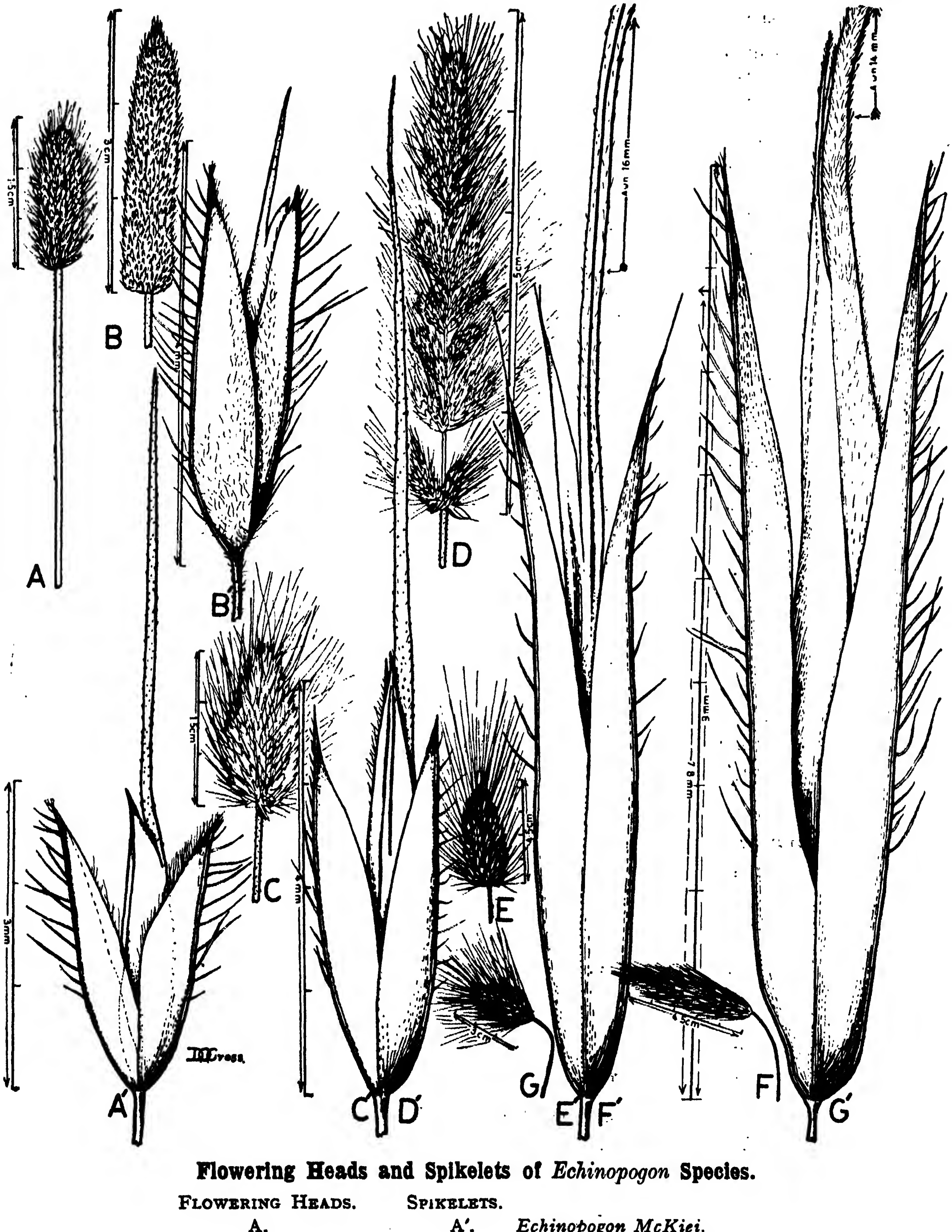
"The experiments show that sheep recover if *Echinopogon* is removed from the diet.

"The time taken for symptoms to appear seems to depend upon the age of the animal (young ones being most susceptible), the stage at which the plant is eaten and the amount of plant eaten (Seddon and Carne, 1926).

"Various treatments have been tried, but the most effective is the removal of the affected animals to areas free from *Echinopogon*. Stock are stated not to eat the plant unless hungry."

The Species of *Echinopogon* in New South Wales.

Botanical Name.	Suggested Common Name.	Illustration Figure.	Distribution.
Echinopogon McKiei ...	"McKie's Rough-bearded Grass."	A & A′	New England Tableland.
Echinopogon phleoides ...	"Slender Rough-bearded Grass."	B & B′	New England Tableland.
Echinopogon cæspitosus...	"Tufted Rough-bearded grass."	D & D′	Widespread in the State, chiefly Coast from Jervis Bay northwards, Blue Mountains, Tablelands generally and South Western Slopes.
Echinopogon ovatus ...	"Forest Rough-bearded grass."	C & C′	Widespread on Coast and Tablelands, but mostly in shady situations.
Echinopogon nutans var. *major*.	"Nodding Rough-bearded grass."	F & F′	New England Tableland.
Echinopogon Cheelii ...	"Cheel's Rough-bearded grass.	G & G′	New England and Southern Tablelands and North Western Slopes and Plains.
Echinopogon intermedius..	"Coarse Rough-bearded grass."	E & E′	North Coast, Central and Northern Tablelands and North Western Slopes.



Flowering Heads and Spikelets of *Echinopogon* Species.

FLOWERING HEADS.	SPIKELETS.	
A.	A'.	*Echinopogon McKiei.*
B.	B'.	*Echinopogon phleoides.*
C.	C'.	*Echinopogon ovatus.*
D.	D'.	*Echinopogon caespitosus.*
E.*	E'.	*Echinopogon intermedius.*
F.*	F'.	*Echinopogon nutans* var. *major.*
G.*	G'.	*Echinopogon Cheelii.*

* These heads on reduced scale to that of A., B., C., D.

Key to Assist Identification of the New South Wales Species of *Echinopogon*.

A. Heads small, with closely compacted spikelets not exceeding 3 cm. in length and 1·2 cm. in width, awns absent or not conspicuous; spikelets small not exceeding 4 mm. in length—

B. Heads bristly, with somewhat noticeable awns up to 3 mm. long; heads not exceeding 2 cm. in length and 1·2 cm. in width .... *Echinopogon McKiei*

BB. Heads not bristly (small awns are sometimes present, but they do not exceed 1·5 mm. in length); heads up to 3 cm. in length and 0·8 cm. in width .... *Echinopogon phleoides*

AA. Heads from small to large, but not with closely compacted spikelets and commonly exceeding 3 cm. in length and 1·2 cm. in width; awns very conspicuous; spikelets usually larger and up to 10 mm. in length—

C. Spikelets not excedeing 5 mm. in length; outer glumes pointed, but not drawn out into fine points; awned glume (*lemma*) 1-2 lobed at the tip, but the lobes not drawn out into very fine needle-like points—the points not exceding 1·5 mm. long; heads usually stiffly erect—

D. Stems more or less tufted, not commonly knee-jointed, with from 2-4 nodes; leaf blades narrow and erect, not exceeding 5 mm. in width .... *Echinopogon caespitosus*

DD. Stems loosely clustered or solitary, mostly knee-jointed at base, with from 3-7 nodes; leaf blades more or less broad, the upper ones spreading or becoming twisted downwards, to 8 mm. in width .... *Echinopogon ovatus*

CC. Spikelets exceeding 5 mm. in length; outer glumes drawn out into fine points; awned glume (*lemma*) drawn out into fine needle-like points at the tip—the points up to 2·5 mm. long—

E. Heads more or less nodding, the stalk beneath the heads usually slender and smooth or very slightly rough—

F. Spikelets not exceeding 7 mm. in length (rarely 8 mm.), the glumes with rigid bristles (*cilia*) or teeth along the back margin (*keel*) ...... *Echinopogon nutans* var. *major*

FF. Spikelets exceeding 7 mm. in length, the glumes with loose long hairs as well as rigid, short bristles along the back margin (*keel*) .... *Echinopogon Cheelii*

EE. Heads not nodding, stiffly erect; the stalk beneath the heads usually more or less coarse and beset with fine downward pointing bristles; spikelets from 5-7 mm. long and with loose hairs and rigid bristles along the back margin (*keel*) of the glumes .... *Echinopogon intermedius*

Summary of Toxicity.

In general, it is concluded from tests that young animals are most susceptible, and that the grass loses some of its harmful properties after it is cut. When in the fruiting stage, it is not as harmful as when in active growth.

Literature References.

1942; HURST, Evelyn; Poison Plants of New South Wales.

1935; HUBBARD, C. E.; Hooker's, Icon. Plan. 5th Series Vol. III. Tab. 3261.

1926; SEDDON, H. R., and CARNE, H. R.; *Agric. Gaz., N.S.W.* xxxvii, 684–690.

1926; SEDDON, H. R., and CARNE, H. R.; N.S.W. Dept. Agr. Sc. Bull. 26; N.S.W. Dept. Agr. Vet. Res. Report No. 2.

1911; HENRY, M., and MASSEY, A. E., *Agr.Gaz., N.S.W.*, xxii 109–117.

Other Important Literature.

1935; CHEEL, E.; *Proc. Lin. Soc. N.S.W.* LX, pts. 5 and 6, p. XLIV.

1898; MAIDEN, J. H.; " A Manual of the Grasses of N.S.W." p. 141.

1892; TURNER, F.; *Agric. Gaz., N.S.W.* Vol. III. p. 388.

1880; BUCHANAN, J.; " Manual of the Indigenous Grasses of New Zealand " p. 27.

1878; BENTHAM, G. and VON MUELLER, F.; *Flora Austr.*, Vol. VII. p. 599.

IN several instances lately lice-infested sheep have been presented at the Queensland border with a view to their introduction into New South Wales. The owners of these sheep have consequently been put to considerable inconvenience. The Department is loath to interfere with the movements of livestock at the present time, but there are already too many lice-infested sheep in this State. Intending purchasers of sheep in south-west Queensland should insist that the sheep shall be free from lice before they purchase them. If they are found to be lice-infested on the road, arrangements should be made to have them dipped *en route*.—MAX HENRY, Chief, Division of Animal Industry.

REDUCED TRAIN SERVICES.

BECAUSE of the shortage of coal the Commissioner for Railways, Mr. T. J. Hartigan, has been compelled, very reluctantly, to make cuts in train services.

It is known that these restrictions will cause hardship and inconvenience to many people. In applying them, the Commissioner endeavoured to spread the burden of sacrifice as evenly as possible.

Unfortunately for country residents it is the long-distance steam trains which consume, in very large quantities, the class of coal that is in short supply. Sufficient coal cannot be obtained by the Department of Railways owing to the very heavy requirements of Defence and other essential services.

Readers of *The Agricultural Gazette* can rest assured that the Railway Administration will not make any cuts in either passenger or goods train services unless they are absolutely necessary, and will restore normal transport as soon as ever the position warrants it.

S. R. NICHOLAS,
Secretary for Railways.

PLANT DISEASES

Notes contributed by the Biological Branch
Division of Science Services

POTATO VIRUS DISEASES.

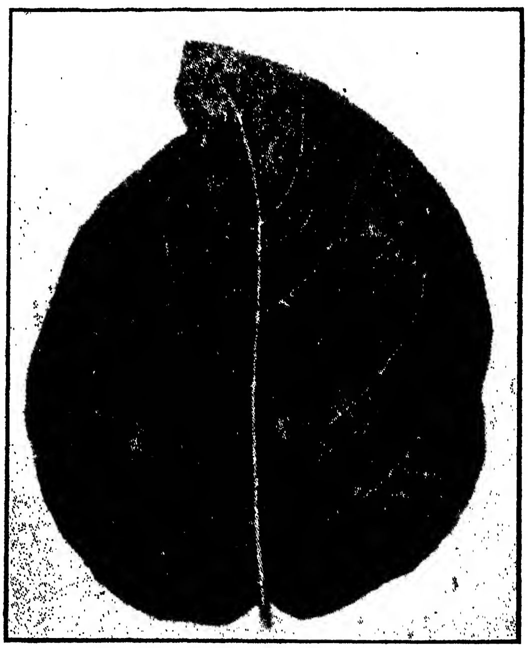
Importance of the X or Latent Virus.

MORE than any other vegetable crop, the potato is subject to attack by virus diseases. The reduction in cropping they cause, and the expense to which growers are put in obtaining virus-free seed at frequent intervals, make this disease-complex one of the most costly of all.

The virus particle is so small it cannot be seen, even under the highest powered microscope. It is introduced into plant tissue, multiplies or increases there and spreads in the living cells throughout the plant, causing various upsets in the normal routine of development—such as the destruction of the chlorophyll (green colouring matter of leaves), disorganisation of the conducting system, death of tissues, and so on.

The visible signs of these disturbances are the symptoms by which the type of virus can be distinguished. There are, however, varieties of plants known as symptomless carriers, which a virus can infect and in which it will multiply, but that show no visible signs of its presence. Virus particles will not multiply except in living cells, and they are usually spread from diseased to healthy plants by insects—mainly aphids. More rarely, contact such as rubbing together of foliage is sufficient to cause spread.

The problem potato seed growers are confronted with arises mostly from the presence in their stud stocks of infected plants, rather than from the entry of virus diseases from outside sources. The system of control they practise in "roguing out" diseased plants, aims at the removal from the seed



Leaf of Carman Potato
Showing the interveinal mottle produced by a mixture of mild and severe strains of virus X, the severe strains being in fairly high concentration.

Crinkle Mosaic produced on Carman by a Severe Strain of Virus A superimposed on X-type Virus.

Mottle extending from the veins and becoming largely interveinal; distortion of the outline of the leaf.

[*After Bald and Pugsley.*

crop or stud plot of virus-infected plants early in the season, so that the plants may not serve as sources of viruses to enable aphids which feed on the crop to become infective. Symptomless-carrier varieties complicate this system of control, and the occurrence of viruses which sometimes cause only mild symptoms in the plants, making roguing difficult, further increases the problem of virus-free seed production.

Leaf of Potato of Factor Variety, showing Symptoms of Rugose Mosaic.

In a number of recent papers Bald and co-workers* have helped to clarify the position regarding potato viruses in Australia.

The chief types of virus responsible for deterioration in potatoes are leaf roll, virus X, virus A and virus Y. The effects of the leaf roll virus are well known to growers of seed potatoes and have been discussed in the *Agricultural Gazette,* August, 1943.

Virus X is present throughout all commercial varieties of potato, and is known as latent mosaic or simple mosaic. It has been found to consist of a number of related

Leaf of Potato of Factor Variety, showing Symptoms of Aucuba Mosaic.

strains, varying in their effect from those causing death of leaf tissue to others causing either a faint mottle or no visible symptoms. The milder strains can only be detected with certainty by inoculation to a

* C.S.I.R. Bulletin 163, Pamphlet 110, Journal 15 (4), p. 300.

more sensitive plant such as the thorn apple (*Datura stramonium*).

Even the mild and indistinguishable strains cause substantial reduction in yield. Bald has obtained reduction of 12 per cent., and in England 16 to 40 per cent. reductions are claimed. It is usual for potato plants to carry a mixture of several strains of the X virus and the intensity of the symptoms depends on the relative proportion of mild and severe strains. Bald has shown that this proportion may change with continued propagation, and that the severe strains multiply the more rapidly, gradually building up, so that unless continued and rigorous selection is carried out the virus strain complex will tend, with succeeding generations, towards the severer type.

Virus A superimposed on strains of virus X causes crinkle, mild mosaic or crinkle mosaic according to the severity of the strains involved. The variety Factor, which is most commonly grown in New South Wales, possesses field immunity to virus A, and accordingly does not show symptoms of crinkle and related forms of mosaic, but Snowflake, Carman, Brownell, etc., are susceptible, and the combination of A and X viruses leads to display of mosaic symptoms in these varieties.

Virus Y superimposed on virus X causes rugose mosaic, an unmistakable disease resulting in pronounced symptoms and substantial reductions in yields.

Another virus sometimes found in New South Wales crops is virus F, causing a very bright distinctive mottle called aucuba mosaic.

The task of eliminating strains of X, or latent virus, from New South Wales seed stocks will involve eventually complete replacement of existing stocks with others which are known to be free or carry only the milder strains. Dr. Bald has already small stocks of X-free lines which he proposes multiplying as quickly as possible with the view later of arranging distribution to seedgrowers.

Late or Irish Blight of Potatoes.

LATE blight developed in epidemic form during the spring in some coastal potato crops, and many growers delayed spraying until it was too late to arrest the spread or had not the spraying equipment. Consequently, crops had to be dug early.

Section of Potato Affected with Late Blight.

As well as causing a destructive blight of the foliage, the late blight fungus can attack tubers, causing rotting in storage and during transport. Tubers may become infected before digging from spores which are washed down from diseased plants into the soil, or through contact with diseased foliage at harvesting. The disease first shows up in the tuber in the form of slightly sunken spots, which are purplish-black in colour. These spots may increase in size until the whole of the tuber is involved. If tubers are cut through in the early stages of the disease, irregularly-shaped, reddish-brown blotches will be observed in the flesh of the tuber just underneath each discoloured spot.

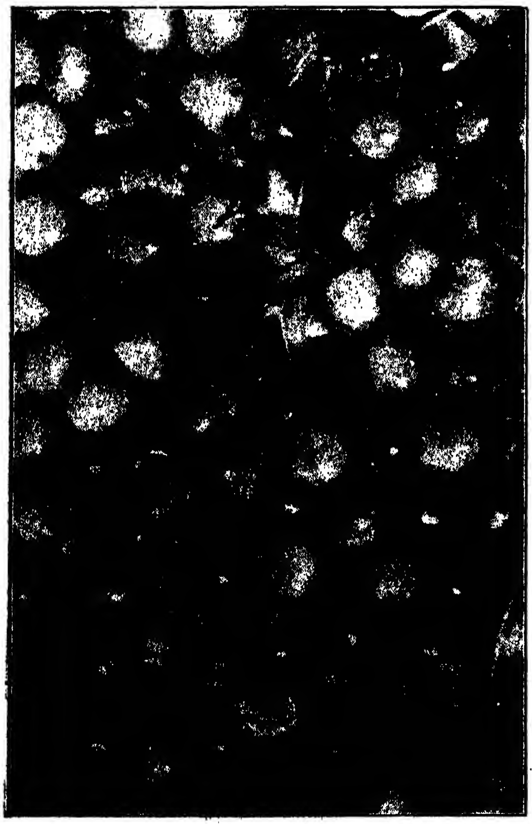
Sometimes the tubers remain comparatively firm and have the appearance of a "dry rot," but more frequently the symptoms are complicated by the presence of secondary bacteria which result in development of a soft, evil-smelling rot.

Sort out visibly-affected tubers before shipping or storing. Tubers should be kept in a dry place and at a temperature of 38 deg. Fahr. or less to retard development of the disease.

Brown Rot.

BROWN ROT is caused by a parasitic fungus (*Sclerotinia fructicola*) which attacks stone and pome fruits. As in the case of other plant diseases which are caused by parasitic organisms, the development of brown rot is greatly influenced by prevailing weather conditions; a spell of close, humid, midsummer weather is often disastrous, both to the fruit ripening on the tree and to fruit in storage or transit. Already this season heavy losses have been experienced by cherry growers.

Although the symptoms are most obvious on the fruits, the fungus often attacks the blossoms and causes a serious blossom blight. Terminal shoots and young leaves may also be affected; brown cankered areas are formed, and drops of gum occasionally may ooze from the infected tissue. Under conditions which favour development of the disease, the fungus may extend until it girdles the stem and kills the twig above the canker. The fungus is able to propagate itself in these areas, and these are sources of infection for the fruits later on in the season.



Cherries Affected with Brown Rot.

The first sign of the disease on the fruits is the development of a small brown spot, which, under favourable weather conditions, rapidly develops in the form of a characteristic brown rot, involving large portions or even the whole of the fruit. Small, greyish-brown, powdery tufts appear at a later stage in these discoloured areas. These consist of myriads of minute spores, which serve to propagate the disease.

Diseased fruits may fall to the ground or remain attached to the tree; the fruits dry and shrivel, and in this stage are known as "mummies." These mummies may produce spores over long periods, and not only are they serious sources of infection while still attached to the tree, but also when on the surface of the ground or when lightly or partially covered by soil in the vicinity of the tree. In spring, mummies partly embedded in the soil may, particularly if protected by weeds and if the temperatures

Fully-rotted Peaches which will soon be "Mummied."

Surfaces covered with one of the two types of brown-rot spore.

are mild and the conditions moist, produce small, cornet-shaped, fleshy structures. These structures, which are from one-eighth to one-half of an inch across and last only a few hours, produce spores which invade

Twig and Blossom Blight on Apricot.
Left:
Tip wilt and bud blight. Note the exudation of gum, and canker (dark-coloured bark) on the right-hand side of twig.
Right:
Blossom remnants, blighted by brown-rot fungus.

the blossoms and twigs and cause severe blighting. Unless disturbed, the mummies in the soil may continue to give rise to these fleshy structures for a number of years.

Control Measures.

1. Particular attention should be paid to orchard sanitation. All mummies and diseased (cankered) twigs should be removed during pruning.

2. Thorough cultivation before the blossoms open is necessary in order to bury deeply any mummies on the soil which may not have been buried by previous ploughing. The butts and crotches of all trees should be thoroughly inspected and all mummies picked up and burnt.

3. Remove all blighted blossoms or diseased shoots at blossoming time. All shrivelling or dead fruits noticed during the growing season should be removed. These have no resistance to the fungus, and, once infected, act as centres for the spread of brown rot. Hail- and insect-damaged fruit is also dangerous.

4. All fruit which has fallen from the tree during the ripening period should be removed and destroyed in accordance with the regulations under the Plant Diseases Act for the control of fruit fly. This will help to minimise the risk of spread of the brown rot disease during the season.

It is important to realise that the application of sprays will be of little avail unless sanitation measures are thoroughly carried out. The spores are so readily carried from an infection centre to adjacent trees that the application of sprays alone is not sufficient to protect the trees from infection. Care should be taken to see that the removal and destruction of diseased fruits, mummies, diseased twigs, etc., are carried out throughout the entire orchard. Where growers are concerned about trees in garden lots, efforts should be made to have all neighbours adopt measures for the control of the disease, as success is best ensured when action is taken on a community basis.

5. When picking, sound and healthy fruit should be collected first, and diseased and mummied fruit should be removed at an

A "Mummied" Fruit Bearing a Crop of the Fungous Structures (apothecia) from which the New Spore Generation is Disseminated.
These structures, which are from one-eighth to one-half inch in diameter, produce millions of spores.

immediate subsequent picking. This minimises the spread of spores from diseased to healthy fruits, thus reducing the risk of infection during transit to market.

6. (*a*) Spray with Bordeaux mixture 6-4-40 or lime sulphur (1 gallon to 20 gallons water) just before or at bud swell. This application is also recommended for the control of Leaf Curl, Shot-hole and Freckle of stone fruits.

(*b*) Further sprays should be applied at the following times:—

(i) At "blossoming."

(ii) At "shuck-fall" (when the flower remnants are shed from the fruit).

(iii) At intervals of three to four weeks from "shuck-fall" until the fruit is harvested.

(iv) If the weather is very humid, a spray should be applied during the seven-day period prior to harvesting. Sprays may also be applied on cherries between pickings if required.

At the above stages the following sprays are recommended for application to all varieties of stone fruits, except early varieties of peaches and apricots in coastal districts:—

(i) Lime sulphur (1 gallon to 160 gallons water); or

(ii) colloidal sulphur (2 lb. to 100 gallons water; or

(iii) wettable sulphur (5 lb. to 100 gallons water).

In respect of the stages mentioned under (*b*), early varieties of peaches in coastal districts must be sprayed only with colloidal or wettable sulphur and not with lime sulphur or copper sprays. Early varieties of apricots in coastal districts should be sprayed with Bordeaux mixture (1½-1-80 plus ½ gallon white oil), or with copper oxychloride (½ lb. to 80 gallons, plus ½ gallon white oil). Proprietary preparations of copper oxychloride, such as "Cuprox," "Oxycop," or "Soltosan" are available. Sulphur sprays should not be applied to early varieties of apricots in coastal areas, because of danger of "sulphur shock."

Cadetships in Agriculture, Soil Conservation and Forestry.

THE Public Service Board invite applications for cadetships in the Departments of Agriculture and Mines (Soil Conservation Service) and in the Forestry Commission. Applications will not be accepted until after the Leaving Certificate results have been announced. They should be submitted on Form 61, obtainable from the office of the Board, or the Government Printing Office, and should reach the Board not later than 19th January, 1943. Applications will not be accepted from candidates over twenty-one years of age.

All cadets will be paid an allowance of £110 per annum (weekly equivalent) during training, and fees for tuition will be met by the Government. Trainees attending the Australian Forestry School (*i.e.*, during the Third and Fourth Year of the Science in Forestry Degree Course) will receive an additional allowance at the rate of £26 per annum for the period actually spent at the School, and equipment to the value of £15 will be provided. The training period will be four to five years. During vacations cadets will be given field, laboratory and office practice. They will be allowed three weeks' recreation leave per annum.

Applicants must be duly qualified for admission to the University as matriculated students in the faculties to which the cadetships apply, and will be required to attend an examination in precis writing at a date to be fixed.

Appointees must be prepared to enter into a bond, with two sureties, in the sum of £500, to persevere with their courses of training, leading to the award of the appropriate degree of B.Sc.Agr., or B.Sc.For., and continue in the service for a period of five years thereafter.

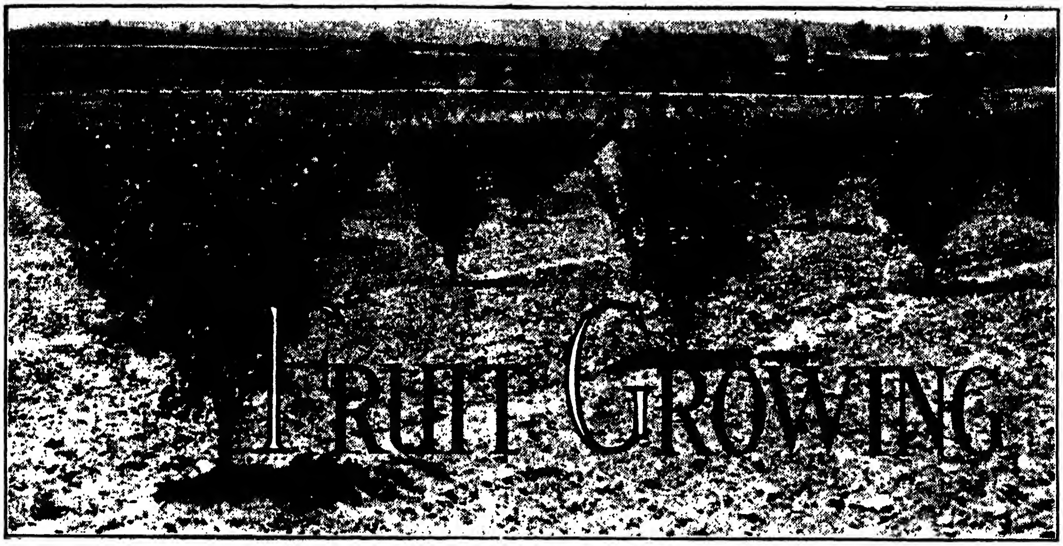
On satisfactory completion of training, cadets will be employed on appropriate work, and paid in accordance with the award or agreement applicable to the position.

Opium Poppies Grown at Armidale.

AFTER inspecting the crop of opium poppies grown by Mr. D. M. Shand, of Woodville, Armidale, Dr. C. Barnard, Senior Research Officer of the Division of Plant Industry, Council for Scientific and Industrial Research, Canberra, stated that this crop was the best which had been grown during the season in Australia, and expressed great satisfaction at the extremely good job that the girl members of the W.A.S.P.S. (Women's Agricultural Security Production Service) had done in undertaking the whole of the work in connection with the production of this crop, which is required for the manufacture of morphine for the Allied Services.

Arrangements for the harvesting of this crop (which will also be carried out by the W A S P.S.) are well in hand. The plants will be harvested by cutting with a reaper and binder and baled. These will be despatched to Melbourne, where the morphine will be extracted in a factory annex specially erected for the purpose.

It is anticipated that the greater part of Australia's requirements will be filled by the morphine produced this season.



Prune Stock Trials at Wagga Experiment Farm.

K. D. McGILLIVRAY, H.D.A., Orchardist.

Various varieties of the Myrobolan and Marianna species have been mainly used in New South Wales as prune stocks, the former having come to be regarded with more favour than the latter. The following report of a trial with stocks for Prune d'Agen and Robe de Sargent prunes, carried out at Wagga Experiment Farm since 1934, while not conclusive, shows that the trial has progressed far enough to indicate the definite failure of some stocks, the doubtful utility of others, and the success of certain combinations.

The botanical phenomenon of the union of two plants of different varieties, and sometimes of different species, by budding and grafting is of great academic interest. The commercial fruit-grower, however, is vitally concerned with the subsequent behaviour of the partnership, because the production of payable crops largely depends on the ability of the two plants to work together in harmony as stock and scion.

The interlocking of cellular tissue proceeds smoothly in some cases but in others varying degrees of reluctance to form a satisfactory union are exhibited. It has not been found possible to resolve whether or not stocks and scions are compatible by application of botanical formulae, and therefore trial in the field is now accepted as the only method.

Robe de Sargent Prune Tree on White Myrobolan Stock.

Details of the Trials.

Prune stock trial plots were planted at Wagga Experiment Farm in 1934, and include three varieties each of Myrobolan and Marianna, and nine other stocks from Australian and other sources. The scion varieties used are Prune d'Ag… and Robe de Sargen… the former being the most important

prune variety in New South Wales. All trees were propagated by budding.

The average annual rainfall at Wagga Experiment Farm is approximately 19 inches. Two of the seasons included in the cropping records were unfavourable, both to tree growth and cropping, and in two others the distribution of the rainfall was such as to retard full crop development, although favouring the growth of trees.

P. besseyii Proved an Unsuitable Stock.
Left.—Union with D'Agen.
Right.—Union with Robe de Sargent.

Replants in the First Four Years.

Certain stock-scion combinations were difficult to establish in the plots. All d'Agen and Robe trees on the three varieties of Myrobolan were established immediately and no replanting was necessary. The same applied to Robe on Marianna varieties, but 6.7 per cent. of d'Agen on Marianna required replanting. The more difficult combinations, and the percentage of each replanted, were as follows:—

Stock.	*Scion.*	*Per cent.*
Cherry plum	d'Agen	55·6
P. besseyii	d'Agen	53·3
Black Damas.........	d'Agen	35·7
P. besseyii	Robe	64·3
"Buck" plum	Robe	53·3

Stocks Which Have Failed.

There is no doubt that the following stock-scion combinations have failed under Wagga conditions, and very little doubt that they would be unsuccessful elsewhere in New South Wales.

Prunus besseyii AS A STOCK FOR BOTH ROBE DE SARGENT AND D'AGEN.

The degree of compatibility of this stock with Robe is particularly low, and it is also low with d'Agen. This is indicated by the enlargement of the scion immediately above the union, a condition which has been responsible for a number of the trees blowing over and breaking off at this point. This stock produces numerous suckers.

Of the original planting in 1934 of Robe on *P. besseyii*, only two trees are now living, the next best being one which lived for six years. The trees reached a size of only about 2 inches diameter at the butt.

Trees of d'Agen on *P. besseyii*, although better than those on Robe, have suffered a 50 per cent. mortality; those now living are characterised by extreme variations in size, the largest having a diameter at the butt of approximately 4 inches and the smallest of approximately 2 inches.

"BUCK" PLUM AS A STOCK FOR ROBE.

"Buck" plum is an unclassified New South Wales stock, the original parent having been introduced in the 1860's; probably of European origin; produces staminate flowers.

The best result from repeated replanting was one tree which lived for six years and attained a height of 2 feet 6 inches and a spread of about 1 foot 6 inches. It then broke off at the union, thus meeting the same fate as several others which lived for a few years. The union was weak, being overgrown by the scion.

FLORIDA PLUM.

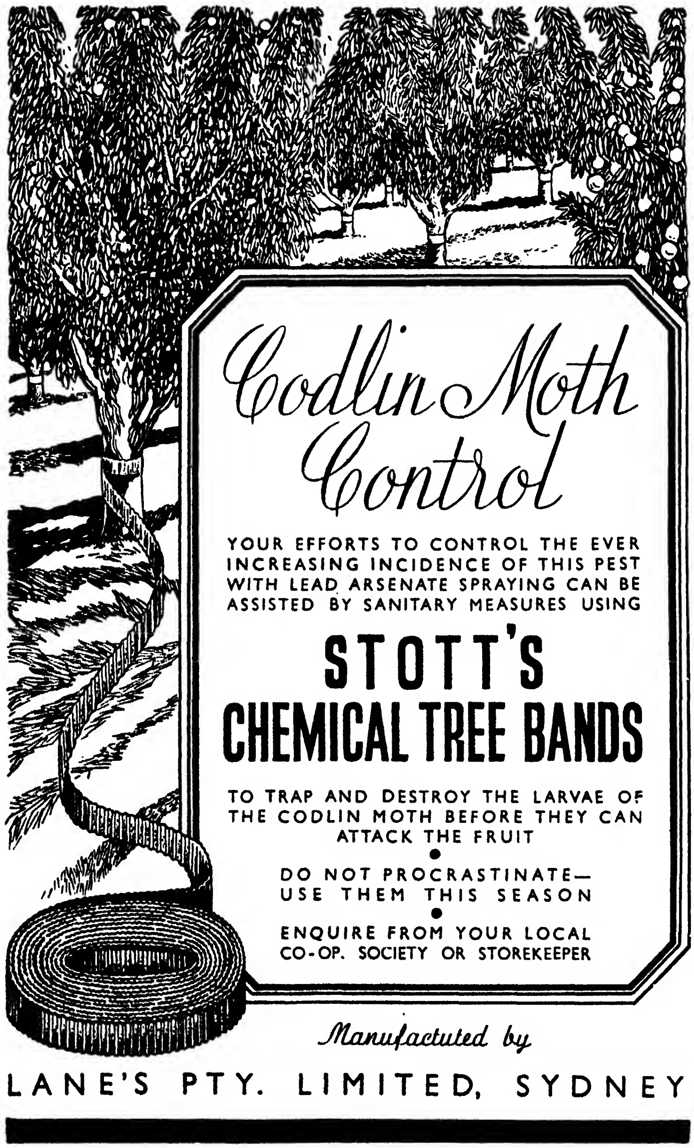
It was not found possible to overcome difficulties in propagating d'Agen and Robe trees on this stock and it did not, therefore, reach the stage of field trials.

"Buck" Plum Used as a Stock.
Left.—Good union with D'Agen.
Right.—Poor union with Robe de Sargent.

Doubtful Stocks.

CHERRY PLUM AS A STOCK FOR D'AGEN.

Results to date suggest serious doubt in connection with this combination. There were no vacancies in the plots after the


Codlin Moth Control
YOUR EFFORTS TO CONTROL THE EVER INCREASING INCIDENCE OF THIS PEST WITH LEAD ARSENATE SPRAYING CAN BE ASSISTED BY SANITARY MEASURES USING
STOTT'S
CHEMICAL TREE BANDS
TO TRAP AND DESTROY THE LARVAE OF THE CODLIN MOTH BEFORE THEY CAN ATTACK THE FRUIT
DO NOT PROCRASTINATE— USE THEM THIS SEASON
ENQUIRE FROM YOUR LOCAL CO-OP. SOCIETY OR STOREKEEPER
Manufactured by
LANE'S PTY. LIMITED, SYDNEY

second year from planting, but since that time 25 per cent. have died. Cropping averages have been low and tree size appreciably smaller than the smallest average of any one on Marianna and Myrobolan.

D'Agen Prune Worked on "Buck" Plum.

BLACK DAMAS AND COMMON MUSSEL AS STOCKS FOR D'AGEN AND ROBE.

Both d'Agen and Robe trees on these two stocks are fairly uniform in size, but they are well below the average size of the Myrobolan and Marianna groups. When this is considered in conjunction with a comparatively low average yield per tree of dried fruit, it seems reasonable, even at this stage, to place them in the doubtful class.

Successful Combinations.

The position at this stage of the experiment is that no successful combination shows sufficient margin of comparative superiority to justify its recommendation in preference to the others.

MYROBOLAN AND MARIANNA GROUPS.

Trees which are of a good standard of size and uniformity have resulted from the combination of three varieties of each of these stocks with d'Agen and Robe. The Marianna group average gives them a slight, but not significant, advantage over the Myrobolan group, in that the fruit is larger and the crop heavier. Against this, trees on Myrobolan are slightly larger than those on Marianna.

"BUCK" PLUM AS A STOCK FOR D'AGEN.

The vigorous and uniform d'Agen trees on "Buck" plum are the largest in the trials. The vigour of the trees and the perfection of the union of d'Agen trees on this stock, and the weakness of Robe trees on the same stock and their failure to unite satisfactorily, provide an informative study of stock-scion relations.

"Buck" plum is not, however, free from disadvantages as a stock for d'Agen. Results to date have shown that it does not root readily from cuttings. The size of the fruit produced on d'Agen trees established on this stock is small; in fact, smaller than on almost all other stocks.

CHERRY PLUM AS A STOCK FOR ROBE.

Cherry plum provides a converse to the "Buck" plum experiences; it favours Robe to the disadvantage of d'Agen, although the variations in any direction are not so marked. It has some claims to recognition as a stock for Robe.

Robe de Sargent Prune Budded on Cherry Plum.

A Table of Results.

The table on page 570 shows the yields obtained from and the growth (butt circumference) made by those combinations which successfully reached the bearing age. In each case the basis of comparison is the stock White Myrobolan A which is shown as 100.

(*Continued on page* 570.)

The Nutritive Value of Australian Tropical Fruits.

E. G. HALL, B.Sc.Agr., Fruit Research Officer.

THE nutritive value of fruits is due mainly to their content of sugar, starch and vitamins, and to a lesser extent to cellulose, fruit acids and pectic substances. The protein content of fruits is, in general, very low, and the fat content is also low except in the flesh of the olive and the avocado. While sugar and starches provide energy for the body, the value of cellulose and pectic substances is due chiefly to their stimulation of peristaltic activity. Many fruits are important sources of essential vitamins, particularly ascorbic acid (vitamin C), and from this aspect tropical fruits are more valuable than those grown in temperate climates.

In this country, where they can readily be grown, much greater use should be made of tropical fruits of high nutritive value, particularly guavas, mangoes and pawpaws. These fruits are far more valuable nutritionally than apples, pears, peaches, plums, grapes and cherries, which form so large a part of the fruit diet of most people in southern Australia.

The composition, from the nutritive point of view, of the principal tropical fruits grown in Australia is shown in the accompanying table, together with data for the apple, apricot, and orange as representative of temperate climate fruits. The figures quoted are considered to be typical for the particular fruits—since in most cases they represent an average of many samples—although considerable variability occurs in composition within any one class of fruit. The figures have been obtained mostly from the results of overseas investigations, but results from this laboratory,* principally in regard to vitamin C, have been used to check, and if necessary correct overseas data.

Avocado.

The flesh has a smooth, buttery texture, due to a high oil content which increases as the fruit matures and varies considerably with variety. Nevertheless, when ripe, this fruit is easily digested. The variety Fuerte is richest in oil, with 26 per cent., whereas some West Indian types have an oil content of only 8 per cent. Unlike other fruits, the avocado has a low sugar content which, again unlike other fruits, decreases as the fruit matures from 2 to 3 per cent. down to less than ½ per cent., and it also has a higher content of protein than other fruits.

Because of the high oil content the avocado has a high energy or fuel value, the Fuerte variety being approximately equal to bread in energy value. It is comparatively rich in minerals, and is higher in copper content than most other fruits. There is an appreciable carotene content, and a vitamin C content of 25 milligrams per cent., which is about the same as that of the tomato. In some parts of Central America when meat and fish are scarce, the avocado becomes the main article of diet.

* Council for Scientific and Industrial Research, Food Preservation Laboratory, Homebush.

Banana.

This well-known fruit has a high food value and, being particularly rich in sugar when ripe, can almost be classed as an energy food. It contains more phosphorus than most fruits and has useful amounts of carotene and vitamin C. When ripe, as indicated by a yellow skin flecked with brown spots and a softening flesh, all the starch has been changed to sugar and the banana is easily digested. When pulped or pureed it is a valuable food for infants. Bananas are as important a food in the tropics as cereals are in temperate zones.

Banana Passion Fruit.

This fruit grows well along the New South Wales coast, but is not very well known. It has a very attractive flavour and is rich in vitamin C.

Custard Apple.

The custard apple is low in vitamin C but still contains twice as much of this essential vitamin as apples or apricots.

Guava.

It has recently been found that some varieties of this hitherto neglected fruit are extraordinarily rich in vitamin C, with an ascorbic acid content of 100 to 500 milligrams per cent., depending on the maturity of the fruit. The vitamin C content is greatest when the fruit is firm ripe, and there is more of this essential vitamin in the skin than in the flesh and more in the outer flesh than in the inner flesh; thus types with a greater proportion of outer flesh have more vitamin C. Pink-fleshed types have usually most vitamin C and white-fleshed types least.

A jelly with 250 milligrams per cent. of vitamin C can be prepared from the skins, and the loss of this vitamin in stewing or in canning is unusually low. A vitamin C concentrate in the form of canned outer flesh and skin of guavas prepared in South Africa was used by Allied troops in North Africa. A guava powder with 2,000 to 3,000 milligrams per cent. of vitamin C and a pleasant aromatic odour and practically no taste can be prepared.

Jujube.

This is a smallish fruit with a comparatively dry flesh, which compares with the date in food value owing to its high content of available carbohydrate. It has a distinct and pleasing flavour when used for pickles, preserves, as stewed fruit or as a confection, but the raw fruit is not palatable. When dried it can be used in puddings, cakes or bread. There are no available data on its vitamin content.

Mango.

This fruit is of high nutritive value, being very rich in vitamins A and C and having a fairly high sugar content, but it is lower in minerals

than other tropical fruits. The pulp has a peach-like texture and is very juicy and aromatic. The mango loses aroma and colour very rapidly after cutting, and therefore must be eaten immediately. It can be cooked and used also for pies or marmalade.

Passion Fruit.

The pulp of passion fruit is rich in sugar, particularly high in acid and contains considerable vitamin C. It has been found at Homebush that the skins are very rich in vitamin C (110 milligrams per cent.) and an open pan concentrate containing 155 milligrams per cent. was prepared from the skins; however, it was viscous and very bitter.

Pawpaw.

The pawpaw is a fruit of very high nutritive value; it is very rich in carotene and vitamin C, being as rich as apricots in the former and richer than oranges in the latter. In addition, the milky juice from the leaves or green fruit and, to a lesser extent, the juice of the ripe fruit, contain papain, an enzyme very active in the digestion of protein. Many people consider pawpaws to be a valuable aid to digestion. Canned pawpaw has been found to have a vitamin C content of about 30 milligrams per cent., and the usual pack of tropical fruit salad, largely due to its content of pawpaw, contains about 20 milligrams per cent. of vitamin C.

Pineapple.

When ripe, *i.e.*, when the smooth surface of the skin is yellowish in colour and the leaves at the tip pull out easily, the common Smooth Leaf variety of pineapple contains about 10 to 15 per cent. of sugar and is a fairly good source of vitamins A, B and C, but is not as rich in A and C as are most other tropical fruits. The common variety in Australia is the Smooth Leaf Cayenne, which contains about 15 milligrams of vitamin C. The juice contains a protein-digesting enzyme, bromelin. The Rough Leaf and Ripley Queen varieties are much richer in vitamin C, the former containing about 47 milligrams and the latter about 34 milligrams per cent.

Persimmon.

The value of the Japanese persimmon is not sufficiently appreciated. It is very palatable when fully ripe, has a relatively high energy value, being rich in sugar, very rich in carotene and rich in vitamin C, and of the drupe fruits it is next to the date in nutritive value.

Rozella or Roselle.

Rozella is a Hibiscus species which is commonly grown in Queensland and remarkable because so many parts of the plant are usable. The flowers, seed pods and young stems can all be used for jams and jellies and the flowers also for pies and tarts.

Breadfruit.

Although not grown in this country, no mention of tropical fruits as foods is complete without reference to the breadfruit, which is as important in tropical countries where it grows as cereals are to us. The unripe fruit is boiled or roasted and used like bread; it can be sliced and dried. It has a very high energy value and is somewhat like sweet potato in texture and flavour.

References.

Proximate Composition of American Food Materials—CHATFIELD & ADAMS, U.S.D.A., Circ. 549, pp. 91, June, 1940.

Food Composition Tables—MARSTON & DAWBARN, C.S.I.R Aust. Pamph. 107, pp. 36, 1941.

Nutritional Charts. H. J. HEINZ & Co., 9th ed., 1940.

Food Composition Tables. NICHOLAS PTY. LTD.

Vitamin Content of Human and Animal Foods—FIXSEN AND ROSCOE. *Nutrition Abst. & Rev.* 1937-38, 7. 823-867.

Vitamin Values of Foods in Relation to Processing and Other Variants. BOOKER and others, U.S.D.A. Circ. 638, pp. 244, 1942.

Vitamin Values of Foods. U.S.D.A. Misc. Publ. 505, 1942.

Data from C.S.I.R. Food Preservation Laboratory, Homebush, N.S.W.

LEGGETT & ROBINSON, *Med. J. Aust.* V. 2, pp. 241-243, Aug. 12, 1939.

Composition of Australian Tropical Fruits.

Fruit.	Moisture.	Available Carbohydrate. Total.	Available Carbohydrate. Acid.	Protein.	Fat.	Fuel or Energy Value.	Ash.	Ca.	P.	Fe.	Vitamin Content per 100 gms. A.	B₁	B₂(G).	C.	P.P.
								Mgms/100 gm.			I.U.	Mgm.	Mgm.	Mgm.	Mgm.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Calories 100 gms.	Per cent.								
Apple	84	13	0·5	0·3	0·4	60	0·3	4	7	0·3	50	0·012	0·006	4	0·5
Apricot	86	12	1·2	0·8	0·1	54	0·6	14	25	1·0	5,000	0·025	0·017	3	0·6
Avocado (variety Fuerte) ...	65	3	...	1·7	26·0	265	1·3	45	44	0·3	350	0·06	0·02	25	...
Banana ...	75	20	0·4	1·2	0·2	100	0·8	9	30	0·6	250	0·06	0·015	10	0·6
Banana Passion Fruit	...	...	...	...	...	...	...	...	...	...	...	0·005	...	44	...
Custard Apple ...	...	...	...	...	...	...	...	...	...	...	...	...	...	8	...
Feijoa	84	10	0·3	0·9	0·2	60	0·5	...	...	...	...	...	...	...	...
Guava	80	11	0·6	1·0	0·6	65	0·7	15	16	0·3	200	0·03	...	100 to 500	...
Jujube	64	32	0·4	1·2	0·3	140	0·9	...	...	...	...	...	...	...	...
Jack Fruit ...	...	...	...	...	...	...	...	...	...	...	500	0·06	...	...	...
Mango	81	16	0·5	0·7	0·2	70	0·5	5	16	0·3	5,000	0·06	0·05	50	...
Orange	87	11	0·7	0·9	0·2	50	0·5	40	25	0·3	200	0·07	0·06	60	0·2
Passion Fruit ...	81	17·5	2·2	1·2	0·0	75	0·5	...	...	...	...	...	...	25	...
Paw-paw ...	87	10	0·2	0·6	0·1	45	0·6	20	13	0·3	5,000	0·02	0·04	70	...
Pineapple ...	84	13	1·0	0·4	0·2	55	0·4	18	25	0·4	100	0·07	0·06	15	...
Persimmon (Japanese) ...	78	19	0·2	0·8	0·4	90	0·6	16	15	0·05	2,000	...	...	25	...

Prune Stock Trials at Wagga Experiment Farm.

(*Continued from page* 567.)

Summary.

A progress report of prune stock trials commenced in 1934 at Wagga Experiment Farm indicates that—

The following stock-scion combinations have failed:—

Stock.	*Scion.*
P. besseyii	Robe de Sargent.
P. besseyii	Prune d'Agen.
"Buck" plum	Robe de Sargent.
Florida plum	Robe de Sargent.
Florida plum	Prune d'Agen.

Those which are considered doubtful are:—

Stock.	*Scion.*
Cherry plum	Prune d'Agen.
Black Damas	Prune d'Agen.
Black Damas	Robe de Sargent.
Common Mussell	Robe de Sargent.
Common Mussell	Prune d'Agen.

Combinations which have met with varying degrees of success:—

Stock.	*Scion.*
Myrobolan and Marianna Groups (three varieties of each)	d'Agen and Robe.
"Buck" plum	d'Agen.
Cherry plum	Robe.

A high degree of compatability has been noted between "Buck" plum and d'Agen, but the relations between this stock and Robe have been extremely unsatisfactory.

Conversely though not to the same extent, Cherry plum favours Robe and produces comparatively weak d'Agen trees which are lacking in uniformity.

A table of results is included.

Prune Stock Trials—Wagga Experiment Farm.

Stock.	Scion.	Origin.	Comparative Crop (White Myrobolan A.100).*	Average Number of Dried Fruits per lb.	Average Butt Circumference.
					millimetres.
P. besseyii	d'Agen	U.S. of America	46	77	231
"Buck" plum	,,	New South Wales	109	90	370
Cherry plum	,,	Victoria	37	83	274
Black Damas	,,	East Malling	37	87	243
Common Mussel	,,	,,	31	79	210
Myrobolan "A"	,,	Victoria	100	92	320
Myrobolan "B"	,,	East Malling	75	83	321
Myrobolan "C"	,,	New South Wales	100	79	306
Marianna "A"	,,	Victoria	114	75	316
Marianna "B"	,,	New South Wales	112	81	320
Marianna "C"	,,	New South Wales	60	90	277
P. besseyii	Robe	U.S. of America	5	60	158
"Buck" plum	,,	New South Wales	5	60	96
Cherry plum	,,	Victoria	91	53	301
Black Damas	,,	East Malling	56	77	220
Common Mussel	,,	,,	61	64	226
Myrobolan "A"	,,	Victoria	100	51	319
Myrobolan "B"	,,	East Malling	139	50	308
Myrobolan "C"	,,	New South Wales	156	50	321
Marianna "A"	,,	Victoria	174	55	302
Marianna "B"	,,	New South Wales	191	54	311
Marianna "C"	,,	,, ,,	143	54	335

*The d'Agen cropping data is given for the four years 1940–43, and Robe data for the two years 1940–41, lack of staff preventing the collection of the data in 1942 and 1943.

Extraction of Citrates and Tartrates from Fruits.

R. J. SWABY, M.Agr.Sc., B.Sc., Assistant Bacteriologist.

PRIOR to the outbreak of war, Australia imported annually over 1,100 tons of citrates from England and 5,000 tons of tartrates from Europe and U.S.A.[1] Citric and tartaric acids are used in the preservation of fruit cordials, wines and jams; sodium citrate as an homogenizer in processed cheese; cream of tartar as an ingredient of baking powder; while tartar emetic is important as an insecticide and in eliminating muzzle-flash in explosives. During wartime it is difficult to obtain supplies of these important materials from overseas, and the possibilities of producing citrates and tartrates in this country were investigated.

It is well known that certain fruits contain appreciable amounts of these organic acids, e.g. in lemons and oranges the principal acid is citric, in unripe grapes it is tartaric, while apples, quinces, apricots and tomatoes contain mixtures of various acids including malic, fumaric and oxalic. In order to determine the possibility of extracting these acids from fruits the amounts present were found by chemical analysis. Similar Australian figures have rarely been published and these results are presented in the following article as a guide to wineries, fruit juice factories and other firms contemplating the recovery of fruit acids.

It was discovered that our fruits contain rather less acids than overseas samples, and it was considered unprofitable to extract them while fruit was scarce and prices high. The sale of by-products such as pectin, essential oils, candied peel and organic manures might reduce the costs, but not sufficiently to enable competition with substitute acids such as citric and lactic prepared cheaply from sugar by fermentation processes. At present cream of tartar is recovered from wine lees, grape skins and argol in South Australia only, and other States might find it profitable to carry this out.

Citrates from Lemons.

A full account of the factors influencing the commercial production of citric acid by the fermentation of sugar with the mould, *Aspergillus niger,* will be published separately.

In Italy, citric acid is economically extracted from lemons [13], and it was considered that culled lemons might similarly be used here. Few chemical analyses of Australian lemons were available, so 1 kilogram of unripe and of ripe fruit from each of two common varieties, Lisbon and Eureka, grown under irrigation and natural rainfall conditions, were collected and analysed. The number of fruit in 1 kilogram weight was found, the juice was squeezed out and the volume noted, titratable acidity measured and citric acid determined by the pentabromacetone[9] method. In addition, the moist weights of the peel and pulp were found, in view of the possibility of using them for the production of candied peel, oil of lemon, and pectin. Data which may assist any commercial firm considering the possibilities of extracting citric acid from lemons and utilising the by-products are set out in Table 1.

The results indicate that slightly more citric acid is obtainable from the variety Lisbon than from Eureka, from unripe fruit than from ripe, and from dry farming areas than from irrigation. The amount of citric acid in Australian lemon juice is lower than in Italian fruit [13], and this together with the extreme shortage of citrus fruits during wartime, makes it economically impossible to extract the organic acid unless the by-products, candied peel, oil of lemon and pectin bring very high prices. It is interesting to note that the fresh peel and pulp constitute over two-thirds of weight of the fruit. Nowadays citric acid extracted from lemons cannot compete with the same acid produced by mould fermentation.

TABLE 1.—ANALYSES OF LEMONS.

Variety of Lemon.	Locality.	Stage of Maturity.	Titratable Acidity. (cc.N.NaOH per 100 cc. Juice).	Citric Acid. (g. 100 cc. Juice).	Analyses of 1 Kgm. Fruit.		
					Number of Lemons.	Volume of Juice. (cc).	Moist Weight of Peel and Pulp. (gm.)
Lisbon ...	Glenfield (natural rainfall).	Half-ripe	97.3	6.2	15.4	262	717
		Ripe ...	96.1	6.0	14.8	268	710
Lisbon ...	Curlwaa (irrigation)...	Half-ripe	92.7	5.7	11.9	284	693
		Ripe ...	89.8	5.6	10.5	290	686
Eureka ...	Gosford (natural rainfall).	Half-ripe	82.5	5.2	13.7	270	708
		Ripe ...	80.2	5.2	13.1	278	697
Eureka ...	Griffith (irrigation) ...	Half-ripe	79.3	5.0	10.6	297	681
		Ripe ...	77.4	4.8	10.2	302	676

TABLE 2.—CHEMICAL ANALYSES OF WINE GRAPES GROWN AT GRIFFITH.

Variety.	Date of Sampling.	Stage of Maturity.	Analyses of 100 Berries.		Analyses of 1 Kgm. of Grapes in Bunches.											
					Juice.						Marc.					
			Weight. (gm.)	Volume of Juice. (c.c.)	Volume. (c.c.)	Density. (Beaume 15.5° C.)	Titratable Acidity. (c.c. N.NaOH.)	Titratable Acidity. (gm. Tartaric Acid.)	Tartrates. (gm. Tartaric Acid.)	Glucose. (gm.)	Wet Weight. (gm.)	Dry Weight. (gm.)	Titratable Acidity. (c.c. N.NaOH.)	Titratable Acidity. (gm. Tartaric Acid.)	Tartrates. (gm. Tartaric Acid.)	Glucose. (gm.)
Doradillo	17-12-42	Unripe ...	138	100	670	3.0	292	21.90	8.96	27.2	282	35	72	5.40	2.93	6.6
	30-12-42	" ...	206	145	698	3.0	298	22.35	8.93	28.0	274	57	51	3.82	2.10	7.3
	14-1-43	" ...	238	156	733	3.5	311	23.35	9.24	31.7	269	55	48	3.60	1.98	8.9
	27-1-43	" ...	317	182	741	5.8	151	11.35	8.10	50.2	256	38	40	3.00	1.99	10.0
	10-2-43	" ...	372	250	750	7.4	59	4.40	7.34	76.3	210	36	21	1.58	1.80	13.6
	25-2-43	Nearlyripe	403	270	748	9.3	43	3.22	7.13	110.5	195	33	12	0.90	2.02	16.9
	16-3-43	Ripe ...	428	278	699	12.1	28	2.10	6.91	136.4	208	36	13	0.98	1.94	24.7
White Hermitage ...	17-12-42	Unripe ...	57	45	588	2.6	276	20.70	10.85	15.7	442	70	137	10.55	3.69	5.9
	30-12-42	" ...	107	85	684	3.0	315	23.60	11.76	29.4	361	42	66	4.95	2.32	6.5
	14-1-43	" ...	134	90	720	4.3	340	25.50	10.12	42.9	268	47	50	3.75	2.03	9.7
	27-1-43	" ...	162	101	737	8.1	133	9.97	7.95	85.2	246	51	35	2.62	1.47	20.6
	10-2-43	Nearlyripe	184	128	750	9.2	76	5.70	7.55	102.7	239	45	36	2.70	1.39	25.1
	25-2-43	Ripe ...	213	140	781	12.0	80	6.00	5.19	140.1	192	44	27	2.02	1.52	27.2
	16-3-43	Over-ripe..	175	103	687	15.0	59	4.43	5.22	168.3	149	41	33	2.48	1.24	23.5
Pedro	17-12-42	Unripe ...	103	76	593	2.4	258	19.35	8.48	12.2	368	45	106	7.95	4.33	4.3
	30-12-42	" ...	134	100	633	2.5	262	19.65	8.98	13.8	312	44	55	4.13	3.10	4.2
	14-1-43	" ...	186	136	752	4.9	224	16.80	8.39	38.7	249	41	31	2.32	2.00	10.8
	27-1-43	" ...	255	160	728	7.9	104	7.80	6.05	82.9	233	33	29	2.18	2.08	20.0
	10-2-43	Nearlyripe	264	166	742	9.9	65	4.88	6.02	116.0	176	32	18	1.35	1.86	18.4
	25-2-43	Ripe ...	253	200	726	12.3	63	4.73	5.76	143.1	200	34	21	1.57	2.23	28.6
Black Sheraz	17-12-42	Unripe ...	92	69	685	3.0	350	26.23	11.90	26.4	261	55	64	4.80	2.63	7.2
	30-12-42	" ...	118	84	676	3.0	296	22.20	11.43	27.1	274	54	74	5.55	1.77	8.7
	14-1-43	Colouring	172	108	697	6.8	98	7.35	6.15	66.3	260	48	38	2.85	1.61	16.9
	27-1-43	Coloured...	197	115	646	9.8	85	6.37	5.72	94.4	287	40	28	2.10	2.30	26.5
	10-2-43	Ripe ...	174	100	650	10.2	65	4.87	5.52	102.7	263	46	24	1.80	1.82	29.2
	25-2-43	Over-ripe..	150	89	644	13.0	54	4.05	5.78	138.1	248	54	26	1.95	2.43	34.3

TABLE 3.—CHEMICAL ANALYSES OF WINE GRAPES GROWN AT COROWA.

Variety.	Date of Sampling.	Stage of Maturity.	Analyses of 100 Berries.		Analyses of 1 Kgm. of Grapes in Bunches.											
					Juice.						Marc.					
			Weight. (gm.)	Volume of Juice. (c.c.)	Volume. (c.c.)	Density. (Beaume 15.5° C.)	Titratable Acidity. (c.c. N.NaOH.)	Titratable Acidity. (gm. Tartaric Acid.)	Tartrates. (gm. Tartaric Acid.)	Glucose. (gm.)	Wet Weight (gm.)	Dry Weight. (gm.)	Titratable Acidity. (c.c. N.NaOH.)	Titratable Acidity. (gm. Tartaric Acid.)	Tartrates. (gm. Tartaric Acid.)	Glucose. (gm.)
Doradillo	25-1-43	Unripe ...	151	95	627	4.3	282	21.17	9.28	38.2	442	70	116	8.73	2.68	10.2
White Hermitage ...	25-1-43	" ...	104	57	692	5.5	265	19.85	9.52	47.8	264	53	51	3.81	2.19	9.7
Pedro	25-1-43	" ...	117	73	704	5.0	300	22.50	10.73	45.6	257	54	50	3.75	3.17	8.2
Black Sheraz	25-1-43	Unripe, not colouring	94	57	714	4.7	338	25.39	11.12	43.1	254	66	48	3.60	1.83	8.5

Tartrates from Grapes.

Several workers [3, 8, 12, 15], have obtained small amounts of tartaric acid from mould fermentations. The possibility of preparing this acid by a fermentation process was explored in vain; out of seventy different fungi grown in sugar solutions at pH values of 3.2, 5.4 and 7.2, three species only produced traces of this acid. Furthermore, no tartrates were formed in vitro from sugars by enzymes prepared from grapes.

Approximately 250 tons of argol (impure cream of tartar) are recovered annually from Australian wines and grape pomace. It was thought that surplus wine-grapes might be used for the extraction of tartaric acid [11], and that unripe berries might contain more tartrates than mature fruit, in which case a higher price per ton would have to be paid for green grapes in order to compensate the grower for his smaller crop.

Many overseas workers [4, 5, 6], have analysed wine grapes, but few figures are available for the tartrate content of Australian grapes, so analyses were therefore made of four varieties at various stages of maturity grown under irrigation at Griffith. Fresh grapes in bunches were crushed in a press and separate analyses made on the juice and marc. First the marc was extracted with boiling water to remove soluble constituents. Tartrates were precipitated as the potassium hydrogen salt [9] and sugar was determined by the method of Shaffer and Hartmann [14]. The weight of 100 grapes was used as a rough index of the relative crop yields obtainable at different stages of maturity. Table 2 presents figures for the volume and density of juice, weight of wet and dry marc, together with the titratable acidity, tartrate and glucose contents of juice and marc.

It will be seen that the combined tartrate content of juice and marc varies between the different varieties of grapes; it is highest in unripe Black Sheraz and lowest in Doradillo. During the ripening process the percentage of tartrate in the bunches decreases from 1.35 to 0.82 per cent. in Black Sheraz and 1.18 to 0.88 per cent. in Doradillo. Despite the usual chemical procedure [9] the tartaric acid content of the grapes cannot be calculated from the titratable acidity, because this value includes other organic acids and often the tartrate is present as crystals of potassium hydrogen tartrate, particularly in mature fruit. The glucose content varies for the different varieties, being highest (19.2 per cent.) in over-ripe White Hermitage and lowest (16.1 per cent.) in ripe Doradillo. During ripening the sugar concentration rises rapidly. The wet marc weighs between one-fifth and one-third of the total weight of grapes, while the dried marc represents between one-thirtieth and one-fifteenth of the total. The skins, seeds and pulp contain appreciable amounts of tartrates.

In order to find whether locality influences the tartrate content of grapes, samples of the same four varieties were collected from Corowa, which is a dry-farming area. Analytical data are presented in Table 3.

A comparison of Table 3 with Table 2 shows that there were no great differences between the tartaric acid content of grapes grown at Corowa and Griffith.

It was found that most of the tartrates may be extracted from the grape juice by the addition of lime and precipitating as the calcium salt, which may be treated subsequently with sulphuric acid to liberate tartaric acid.

The possibility was explored of using the lime-neutralised sugary juice from half-ripe and ripe grapes for wine production as a means towards reducing the cost of tartaric extraction. The extracted tartaric acid was replaced by small amounts of citric acid and the juice fermented with a wine yeast. The wines produced from half-ripe grapes contained less alcohol than those from ripe grapes owing to the lower sugar content, but both were palatable.

Assuming an average of 0.8 per cent. of tartaric acid in wine grapes, it can be calculated that half of the Australian average annual crop of 90,000 tons would yield approximately 360 tons of this acid. It is doubtful, however, whether it would pay to precipitate this as the calcium salt from wine grapes except in cases of urgent necessity. At present tartrates are extracted mainly from by-products of South Australian wineries [7], and if fermented grape skins and seeds of wine lees and argol from other States were treated similarly, the present output could be increased [10].

Tartrates from Other Fruits.

Various acidic fruits such as lemons, quinces, apricots, apples and tomatoes were examined as possible sources of tartaric acid, but small amounts only were found. However, pods obtained from tamarind trees (*Tamarindus indicus*) growing in Townsville yielded large amounts, as shown by Table 4.

TABLE 4.—ANALYSIS OF TAMARIND PODS.

Stage of Maturity.	Analysis of 100 gm. fresh pods.					
	Titratable Acidity (cc. N.NaOH).	Titratable Acidity (expressed as gm. tartaric acid).	Total Tartrates (expressed as gm. tartaric acid).	Potassium Hydrogen Tartrate (gm.).	Free Tartaric Acid (gm.).	Moisture (gm.).
Ripe ...	103·2	7·74	7·42	2·64	5·32	25·3
Half-ripe ...	42·0	3·15	3·03	0·01	3·02	56·7

Ripe pods contained 5.32 per cent. of tartaric acid and 2.64 per cent. of cream of tartar, while half-ripe pods contained 3.02 and 0.01 per cent. respectively. These amounts were lower than obtained from Indian tamarinds [16], but were sufficiently high to warrant further investigation. It was estimated that all the tamarind trees scattered throughout Queensland would yield approximately only several hundredweights of tartaric acid; hence it would not be profitable to harvest the pods and extract the acid. The possibility of planting these trees for the production of tartrates does not seem feasible, because they take five to eight years to mature.

(*Continued on page* 580.)

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
		1943.
W. J. Stephenson, "Hill View," Fig Tree ...	57	1 Dec.
Wollongbar Experiment Farm...	112	4 „
Barnardo Farm School, Mowbray Park ...	75	4 „
A. E. Liggins, "St. Leger Dairy," Kuring-gai Chase Road, Turramurra North	52	7 „
State Penitentiary, Long Bay	10	„
A. L. Logue, "Thornbro," Muswellbrook ...	46	13 „
Woomargama Estate	207	22 „
A. Hannaford, Braidwood	20	26 „
W. S. Grant, Braidwood	20	26 „
Department of Education, Gosford Farm Home	40	29 „
		1944.
Limond Bros., Morisset	60	13 Jan.
J. M. Turnbull, "Pastime," Kayuga Road, Muswellbrook	75	15 „
E. R. Fishlock, Fig Tree, Wollongong ...	38	18 „
Penney, C. A., "Bringa," Dapto	198	25 „
St. Ignatius College, Riverview	25	27 „
Department of Education, Yanco Agricultural High School	69	6 Feb.
Riverina Welfare Farm, Yanco	74	6 „
St. John's College, Armidale	30	8 „
A. C. O'Dea, Perry Street, Dundas	28	14 „
McGarvie Smith Animal Health Farm, Liverpool	55	22 „
C. Wilton, Bligh Street, Muswellbrook ...	75	3 Mar.
N. L. Forster, Abington, Armidale (Aberdeen Angus)	188	12 „
Forster and Sons, Abington, Armidale (Jerseys)	87	13 „
Lunacy Department, Morisset Mental Hospital	84	15 „
Wagga Experiment Farm (Jerseys)	81	20 „
Trangie Experiment Farm, Trangie	121	20 „
New England University College, Armidale ...	12	31 „
St. Michael's Orphanage, Baulkham Hills ...	18	31 „
W. H. Long, Brodie's Plains, Inverell ...	44	13 April.
A. G. Wilson, "Blytheswood," Exeter ...	62	14 „
H. F. Bradley, "Nardoo," Ashford Road, Inverell	35	15 „
Grafton Experiment Farm	191	15 „
Lunacy Department, Callan Park Mental Hospital	26	1 May.
T. J. Wilks, "Oaks Farm," Muswellbrook ...	37	5 June.
E. J. Cottell "Kapunda," Rob Roy, Inverell	50	23 „
L. W. Campbell, "Dunmallard," Fern Hill Road, Inverell	32	23 „
E. D. Rankins, "Oakwood," Inverell ...	23	23 „
J. O. McGufficke, "Lovely Bank," Rob Roy, Inverell	20	23 „
J. H. Lott, "Bellevue," Rob Roy, Inverell ...	23	23 „
Cowra Experiment Farm	66	24 „
New England Experiment Farm, Glen Innes (Jerseys)	73	27 „
G. T. Reid, "Narrengullen," Yass	274	3 July.
Farm Home for Boys, Mittagong	49	[illegible] „
Lunacy Department, Rydalmere Mental Hospital	50	19 „
St. Vincent's Boys' Home, Westmead ...	26	20 „
Lidcombe State Hospital and Home	106	30 „
Hurlstone Agricultural High School, Glenfield	37	31
Ehsman Bros., Inverell	28	13 Aug.
E. L. Killen, "Pine Park," Mumbil	252	24 „
Peel River Land and Mineral Co., Tamworth (Beef Shorthorns)	82	28 „
Berry Training Farm, Berry	136	21 Sept.
Bathurst Experiment Farm	25	18 Oct.
Lunacy Department, Gladesville Mental Hospital	34	23 Nov.
Hawkesbury Agricultural College, Richmond (Jerseys)	110	18 Dec.
		1945.
The Sydney Church of England Grammar School, Moss Vale	51	5 Feb.
Koyong School, Moss Vale	2	8 „
New England Girls' Grammar School, Armidale	30	11 „
W. W. Martin, "Narooma," Urana Road, Wagga	143	22 „
R. C. Dixon, Elwatan, Castle Hill (Jerseys) ...	31	29 Mar.
Lunacy Department, Parramatta Mental Hospital	66	30 „
A. E. Stace, Taylor Street, Armidale	38	1 April.
A. D. Frater, King's Plain Road, Inverell ...	123	12 „
F. C. Harcombe, Hillcrest Farm, Warialda Road, Inverell	38	13 „
Parker Bros., Hampton Court Dairy, Inverell	180	17 „
H. F. White, Bald Blair, Guyra (Aberdeen Angus)	186	30 „
Emu Plains Prison Farm	108	7 May
A.G.H. (114) Australia...	70	11 „
Sir F. H. Stewart, Dundas	12	5 June.
Kahlua Pastoral Co., "Kahlua," Coolac ...	205	21 „
S. E. E. Cohen, Auburn Vale Road, Inverell...	33	22 „
B. N. Coote, Auburn Vale Road, Inverell ...	79	22 „
A. N. De Fraine, Reservoir Hill, Inverell ...	28	22 „
J. McKenzie, Inverell	19	17 Aug.
W. J. Frizelle, Rosenstein Dairy, Inverell ...	93	17 „
W. Budden, "Hunter View," Kayuga Road, Muswellbrook	17	24 „
Farrer Memorial Agricultural High School, Nemingha	36	30 „
Fairbridge Farm School, Molong	97	7 Sept.
The William Thompson Masonic School, Baulkham Hills	42	16 „
Australian Missionary College, Cooranbong ...	121	10 „
Navua Ltd., Grose Wold, via Richmond (Jerseys)	116	20 „

Tubercle-free Areas.

The following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis :—

Bombala Area.
Inverell Area.
Braidwood Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

MAX HENRY, Chief of Division of Animal Industry.

OVER-STOCKING is probably the greatest contributing factor in pasture deterioration in New South Wales. In many cases the overstocking has been due to rabbits as well as stock, and this combined with the effects of drought, has resulted in many pastures becoming denuded of the original covering of native grasses.

Sown pastures may often be stocked at the rate of twenty to thirty sheep per acre without being over-stocked, and so long as they are removed or the numbers reduced before the plants are nibbled too close, no harm will be done. If, however, this rate of stocking is persisted with, it will not be long before the most palatable species disappear, followed in time by the less palatable species. As the grasses and clovers become eaten out, unpalatable plants and weeds will obtain a hold, until finally they will assume control to the detriment of the area in stock-carrying capacity and drought-resistance.

AN IMPROVED METHOD OF——

RE-USING SHEEP JETTING MIXTURES

FOR BLOW-FLY CONTROL.

●

E. S. May, Assistant Sheep and Wool Instructor.

WITH the approach of summer, sheep men can expect fly activity among their flocks again, and will need to prepare for this eventuality. Jetting provides a means of giving protection, and helps to overcome the manpower problem which confronts graziers to-day. When properly done with calcium arsenite, a five-weekly jetting programme during fly waves gives efficient protection at a cheap rate.

It is usually necessary to jet four times each year, sometimes five times, according to the severity of the waves. The overall cost of each operation is ⅛d. per head when regurgitation is adopted. Combining this with a mid-season crutching, full protection can be given for the total cost of not more than 5d. per sheep per year.

A leaflet setting out the Department's recommendations for the construction of a jetting race, the making of calcium arsenite and the use of jetting equipment is available, and sheepowners who desire a copy of it should write to the Chief, Division of Information and Extension Services, Department of Agriculture, Box 36A G.P.O., Sydney.

The purpose of this article is to describe a method of regurgitation (returning the fluid which drains from the sheep to the tank for re-use), which has been developed at Trangie Experiment Farm during the past 18 months, and which has made the work easier and generally added to its efficiency. All types of sheep have been handled with satisfactory labour saving results, especially when jetting sheep with long wool.

With this method, the jetting plant is placed in a pit sunk into the ground near the box, with the end of the pit level with the exit door of the box, the pit being of such a depth that the tank is a little below ground level. The jetting mixture which runs from the sheep during the operation is caught in a tray underneath the box, and is returned direct to the tank along a length of guttering, through a silt trap and thence to the jetter tank. This does away with the constant attention necessary when the run-off is caught in buckets and lifted into the tank, and the man attending to the mixtures can assist for longer periods with the sheep, thus enabling faster jetting. When using a two- instead of a three-man team, the work is considerably facilitated.

The Jetting Plant in Operation at Trangie Experiment Farm.

Note that the jetting machine is in a pit so that the mixture draining from the sheep gravitates back into the tank for re-use.

The Pit.

The size of the pit varies according to the type of plant used. The main points to be taken into consideration are:—

(1) The pit should be deep enough for the top of the tank to be 2 inches below ground level.

(2) It should be large enough to take the plant and have a clearance of 6 inches between the wheels and the walls.

(3) The floor of the pit should be level.

(4) The distance from the box to the nearest corner of the pit should be 2 to 4 feet. This will allow sufficient slope of the guttering for the mixture to run away quickly. A fall of ½ inch per travelling foot is necessary.

(5) The walls of the pit should be protected from erosion by timbering, cementing or with sheets of galvanized iron nailed to posts erected in the pit.

(6) A ramp is necessary so that the plant can be wheeled into the pit. Cut a track or trench 4 inches deep and 5 inches wide along the floor of the ramp for the wheels to run in. This assists greatly in steering the plant into correct position.

The Silt Trap.

A trap—to catch grit particles that are washed from the feet of the sheep during jetting—is needed to prevent these particles passing through the pump and causing excessive wear on leathers and valves. The trap is hung from the wall of the pit, between it and the tank, so that the spout can carry the return liquid into the entrance of the tank.

An efficient trap can be made from a 2- to 3-gallon tin that has flat sides. The dimensions should be 4 inches wide, 9 inches long, and 15 inches deep. The spout should be 1½ inches square, with a downward incline and long enough to reach to the entrance of the tank; it is let into the 9 inch side of the trap—near the end and the top of the side nearest to the jetting box.

The liquid runs into the trap at the opposite end to the spout so that the grit particles will not be caught in the stream and flow straight into the tank. The movement of mixture in the trap is sufficient to keep the calcium arsenite in suspension, yet gentle enough to allow heavy grit particles to drop to the bottom. The trap can be cleaned out as occasion demands.

Disposal of Waste Mixture.

Waste arsenical mixtures should always be disposed of so that stock cannot have access to them. When arsenic is allowed to run about the yards it will subsequently blow about in the form of dust and could be dangerous to animals and man alike. A small well, sunk near the pit, not less than 5 feet away, provides a suitable place for such disposal. When boarded over it can also be used to stand buckets of freshly prepared mixture on, and will catch all drainings from them. This will also keep the buckets free from dirt that would otherwise find its way into the mixture.

Points to Observe When Jetting.

(1) The mixture must be correctly prepared.

(2) Thorough saturation of the wool is essential.

(3) When regurgitating, keep the tank at a constant level, preferably full, so that the mixtures will not weaken.

(4) Have the sheep presented to the operator quickly and in the correct position.

(5) Jet before flies become too active, and again five weeks later.

W.A.S.P.S. Work in a Shearing Shed.

FOR the first time in the history of the organisation, members of the W.A.S.P.S. (Women's Agricultural Security Production Services) recently undertook to provide all the labour (other than shearing) in a shearing shed.

The team, which consisted of Mary Burt, Hilda Atkins, Dulcie Edwards and Betty Tout, worked at Armidale on the property of Mr. D. M. Shand, Hon. Organiser of the W.A.S.P.S. These girls have not only had experience in every type of farm work from ploughing to harvesting crops, but have also attended the Technical College lectures in wool classing. Their job in the shed included picking up the fleeces, sweeping odd bits of wool, "skirting" to remove dirt and burrs, and rolling and classifying the fleeces. They also kept the tally book, branded the shorn sheep, and drove the sheep to the shed and back to the paddocks.

Mr. Shand, whose shearing shed is one of the last to cut out in New South Wales this season, said of these girls: "These W.A.S.P.S. have taken to shearing shed work like ducks to water. By proving that women can do 90 per cent. of men's jobs around the farms, they are helping very considerably to relieve the manpower shortage in country districts of New South Wales, and are supplying the farmers with much labour to increase production of food for service men and civilians!"

FEEDS and FEEDING NOTES.

Contributed by
The Division of Animal Industry.

By-products of Food Manufacture for Stock Feeding.

NEW food industries established in Australia have provided many opportunities for stockowners to obtain excellent stock feed, often only for the expense of carting it away. Nevertheless in some cases stockowners have been slow to realise the potential food value of these by-products and tons of valuable food material have been wasted.

Citrus Pulp, Pea Cannery Waste, Carrot Waste.

Typical examples of by-products from food manufacturing processes which can be used as stock feed are the by-products of the citrus juice industries (citrus pulp), the carrot processing industry (carrot waste) and the pea canning industry (pea cannery waste). Citrus pulp is available in some country centres and in the metropolitan area, and experiments to determine its value for dairy cattle are to be conducted. From overseas observations it appears that it should be an excellent feed for cattle, as the dry matter of the pulp has an energy or starch unit value approximately equal to that of grain. However, it is very low in protein and should, for milk production, be supplemented with protein-rich feeds such as lucerne hay or oil meals. It could be used to replace some of the grain and cereal roughages in the ration, and up to 30 lb. per day can apparently be fed without trouble. The material has no effect on the quality of the milk.

Carrot waste can find a ready use as a feed for cattle and pigs, and is especially valuable for these stock when green feed is not available—owing to its extremely high content of Vitamin A.

Pea cannery waste—the green vines and empty pods of pea plants which have been thrashed for peas for canning—are available in several country centres and constitute an extremely valuable, protein-rich roughage for cattle or sheep. At present it is apparently being wasted. The green material can be ensiled either in a pit or stack, making a silage of very good feeding value. If the vines have not been broken too extensively, it may be possible to spread out and dry the material and bale the resultant hay. Such a hay should be approaching lucerne hay in food value.

These three examples of by-products which can be used for stock feeding give some idea of the possibilities that lie in this direction. Look about your own district. Are any of these materials available? Are there any other by-products which you consider might be used as feed? If in doubt about the feeding value of any such by-products contact this Department for advice on the matter.

Preparation of Grain for Feeding Stock.

THE methods of preparation of grain—such as grinding and the degree of fineness of grinding, boiling, soaking, etc.—have an important effect on the value of grain for stock.

For cattle, grains such as wheat, barley, maize, oats and sorghum should be coarsely ground. If fed whole, all the grain is not sufficiently digested, and if finely ground, digestion may be upset (especially with wheat), the material is not very palatable, and there is no increase in digestibility over the coarsely-ground grain. Further, the cost of fine grinding may be twice that of coarse grinding on account of the greater power required.

Pigs being hand fed should have the grain coarsely crushed, so that the materal is granular and not floury. However, oats should be thoroughly ground for pigs as, if not, the digestibility is very low. There is no necessity to crush grain if pigs are being fed by self-feeders as self-fed pigs apparently masticate grain more efficiently, being able to feed more leisurely. In the case of

maize there is probably very little advantage in crushing for pigs even when it is hand fed, as the slight increase in digestibility obtained from crushing is usually more than outweighed by the cost of crushing.

Boiling, soaking and steaming have, in the past, been advocated for improving the digestibility of grain, but experimental work has shown that there is no benefit to be obtained from these practices, except in some special cases. In fact, these treatments have frequently been shown to decrease the food value of grain. The exceptions are that soy beans (and, incidentally, potatoes) should be cooked for pigs, and that where no crushing facilities are available, soaking should be useful for very small or very hard grain.

Damping of crushed grains will not improve the digestibility but may improve palatability and ease of handling, especially in windy weather.

Sheep masticate grain very efficiently and there is no need to crush any grain for these stock.

Current Feeding Costs.

Feed.	Starch Unit Value per 100 lb.	Protein Unit Value per 100 lb.	Cost.	Cost per Starch Unit.	Cost per Protein Unit.	Remarks.
			ROUGHAGES.			
Lucerne hay and chaff (good, sound).	35–45 (av. quality 40).	10	£7–£10 long ton ...	1.9d.–2·7d.	...	Roughages continue to be dearer, as sources of food matter, than concentrates, although the cereal roughages are about equal in price to the dearer starchy concentrates such as maize.
Oaten chaff (good, sound).	40	3	£5 15s.–£7 10s. long ton	1·6d.–2d.	...	
Wheaten chaff ...	40	3	£5 10s.–£6 10s. long ton	1·5d.–1·8d.	...	
Oaten hay	33	3	£5 10s. long ton ...	1.8d.	...	
Wheaten hay	33	3				
			STARCHY CONCENTRATES.			
Wheat	72	8	3s. 6¾d. per bushel in truck lots—bagged.	1d.	...	Wheat and barley, the cheapest sources of food matter, pollard and bran the next cheapest, followed by oats, with maize the dearest source of food matter. Barley very scarce, and barley meal almost unprocurable.
Wheatmeal	72	8	£7 5s. short ton ...	1·2d.	...	
Maize	78	8	7s. 2d. bushel	2d.	...	
Maize meal	78	8	£14 short ton	2·2d.	...	
Barley	71	7	3s. bushel	1d.	...	
Barley meal	71	7	Not quoted.	......	...	
Oats	62	8	2s. 4d.–2s. 10d. bushel	1·2d.–1·4d.	...	
Crushed oats	62	8	3s. 10d. per 40 lb. ...	1·8d.	...	
Pollard	66	10	£6 short ton, f.o.r. ...	1·1d.	...	
Bran	56	10	£6 short ton, f.o.r. ...	1·3d.	...	
Molasses	50	1	£3 10s. per 40-gal. drum	3·4d.	...	Supplies available, but a dear feed.
			PROTEIN CONCENTRATES.			
Linseed meal	72	25	£9 10s.–£10 10s. short ton.	1·6d.–1·7d.	4·5d.–5d.	Supplies limited.
Peanut meal	78	43	£6 10s. short ton ...	1·1d.	1·8d.	Supplies limited.
Cocoanut meal ...	76	15	£7 short ton, f.o.r. ...	1·1d.	5·1d.	Supplies available.
Meat meal (55–60% crude protein grade).	80	55	£10 10s. short ton ...	1·6d.	2·3d.	Supplies limited and rationed. Priority for pigs and poultry.
Meat meal (45 % crude protein grade).	60	40	£10 short ton	2d.	3d.	
Blood meal	63	68	£14 short ton	2·7d.	2·5d.	

MINERAL SUPPLEMENTS.

Mineral.	*Cost.*	*Supplies.*
Ground calcium carbonate (limestone)—a calcium supplement.	34s. per ton in bags, (truck lots).	Supplies very limited.
Bone meal (a calcium and phosphorus supplement)...	£14 10s. per ton, F.O.R.	Supplies limited.
Bone flour (a calcium and phosphorus supplement)...	£11 15s. per ton, F.O.R.	Supplies available
Shell grit (a calcium supplement)	30s. per ton (bulk) ...	Supplies available
Dicalcic phosphate (a calcium and phosphorous supplement)		Unavailable.

The Price of Wheat for Stock Feeding.

THE Australian Wheat Board has advised that wheat for feeding livestock and poultry is now available at a maximum price of 3s. 6¾d. per bushel, bagged, in truck lots on rail at buyer's station.

The price mentioned is also the basis price on rails Sydney. If wheat is purchased by feeders in a wheat growing district, and they take delivery from the local stack at a time when it is open for

trucking, any quantity from one bag upwards is sold at the basis price mentioned, less rail freight from such station to Sydney.

Stock feeders and poultry owners in or near the wheat areas can purchase by the truck load at the basis price named, less railage from sending station to Sydney, and they pay the railage from the sending station to destination. Consequently where the mileage to the destination station is less than the mileage to Sydney, the buyer secures the wheat at a landed cost proportionately less than 3s. 6¾d. per bushel.

For the benefit of those situated in areas involving a railage greater than from sending station to Sydney, the maximum price has been fixed at 3s. 6¾d. per bushel on rails at destination station. The result is that those who are in or near to the wheat growing areas still enjoy the benefit of that proximity, whilst those who are more distant, such as coastal and northern rivers stockowners, will have to pay no more than the Sydney price for their wheat.

Value of Colostrum (Beastings) for Calves.

THE first milk after calving, or the colostrum, is usually and correctly fed to calves, but occasionally one sees the material being milked out and discarded, the newly-born calves being fed on normal milk. This practice is most inadvisable for the following reasons:—

At birth, calves have only a weak resistance to disease-producing bacteria, have no supply of the protecting vitamin A, and have no source of food matter with which to commence their individual existence. Colostrum remedies these deficiencies much more efficiently than ordinary milk.

Colostrum contains—

Up to ten times as much vitamin A as ordinary milk.

Up to five times as much protein as ordinary milk.

Up to twice as much minerals as ordinary milk.

Is extremely rich in bacteria anti-bodies.

Has a stimulating effect on the bowel.

The vitamin A content of normal milk is profoundly influenced by the amount of green food in the ration of the dam, but the vitamin A content of the colostrum is not so largely influenced by this factor as the dam will drain its vitamin A body resources to provide a high level of vitamin A in the colostrum. Insufficient vitamin A in the ration for calves will lead to increased susceptibility to scours and poor growth, so that provision of a rich source of vitamin A such as colostrum, with which to commence life, is of considerable importance.

"Anti-bodies" are the materials produced in the dam's body for protection against disease-producing bacteria, and are passed on to the calf through the colostrum as a ready-made defence against bacteria, until the calf can produce its own anti-bodies. An interesting fact concerning these anti-bodies is that it is only during the first two days of life that they can be absorbed by the intestine. After this time they are destroyed by the digestive juices, again illustrating the necessity for immediate feeding of colostrum after birth.

Shortage of Phosphorus Supplements.

THERE is at present a shortage of phosphorus supplements, such as bone meal and bone flour. These materials are essential under some circumstances, but in others they are used needlessly. The following summarises the position as regards the necessity of phosphorus supplements for large stock:—

Cattle.—Where cattle are hand-fed with concentrates such as bran, pollard, grains and protein concentrates, there is no necessity for phosphorus supplements owing to the richness of these materials in phosphorus. Bone meal or bone flour, 1 to 2 oz. per day, or a bone meal and salt lick should be provided where cattle are being heavily fed on lucerne hay without concentrates or are grazing on phosphorus-deficient country which has not been topdressed with superphosphate.

Pigs.—Owing to the richness in phosphates of the usual pig feeds, phosphorus supplements are not required for pigs unless they are grazing on phosphate-deficient soil

which has not been topdressed. Wheat, pollard, meat meal and skim milk are rich in phosphorus.

Sheep.—Use of phosphorus supplements for sheep has been prohibited under National Security Regulations, this action being taken after extensive experimental work on extremely phosphorus-deficient country had demonstrated that phosphorus supplements are of no value for sheep, as apparently, under all practical conditions, phosphorus deficiency is never the limiting factor in the diet. More often it is a protein deficiency.

Application for Assistance for Fodder Conservation.

DR. R. J. NOBLE, Under Secretary and Director of the Department of Agriculture, who is Chairman of the New South Wales Fodder Conservation Committee, has drawn attention to the arrangements that have been made to deal with applications from farmers who desire financial assistance in the growing and storage of fodder or the holding of fodder already stored. Applications may also be made by farmers with relation to pasture improvement.

Application forms are available at branches of the Rural Bank, and managers of branches are in a position to inform farmers as to the conditions under which advances may be made. The field staff of the Department of Agriculture are also well informed in this connection and will be glad to advise farmers.

Fodder conservation is vitally related to the nation's plan for increased food production, stated Dr. Noble, and every effort will be made by the Committee in association with the Director-General of Agriculture, Mr. Bulcock, to impress this fact upon farmers, and to ensure the conservation of the greatest possible amount of feed during the present season. The Dairy Mechanisation Scheme, instituted by the Premier, is already having an influence on crop production which should operate to the benefit of the output of dairy products.

The Committee has addressed a communication to the principal primary producers' organisations, inviting them to submit suggestions for measures which might be adopted in connection with a fodder conservation programme. It is anxious to co-ordinate its activities with those of existing organisations in a determined and sustained drive for the safeguarding of the food requirements of the livestock of the State.

Extraction of Citrates and Tartrates from Fruit.

(*Continued from page* 573.)

Conclusions.

It does not appear to be economical to extract citric and tartaric acids from Australian fruit. The present shortage of acids can therefore best be relieved by substituting acid phosphates or using citric and lactic acids produced by fermentations.

Acknowledgments.

The author gratefully acknowledges the services rendered by Mrs. M. Burdell, of Townsville; Messrs. J. R. Rengger, of Glenfield; W. H. Reeves, of Curlwaa; J. Mackay, of Lindeman Ltd., Corowa; R. J. Benton, T. B. Kiely, H. L. Manuel and A. C. Clifton, of the N.S.W Department of Agriculture, who supplied fruit; Mr. M. Lawson, Laboratory Assistant, who helped with the preparation of samples for chemical analyses; and by Mr. C. T. White, Government Botanist, Queensland, who assessed the crop yield of tamarind pods in that State.

REFERENCES.

Australia, Commonwealth Bureau of Census and Statistics, Oversea Trade and Customs and Excise Revenue Bulletins.

[2] Australian Patent 115, 130. 14 May, 1941.

[3] BERNHAUER, H. and BOCKL, N.: *Biochem. Z.*, 253: 16–24, 1932,

[4] BIOLETTI, F. T., CRUESS, W. V. and DAVI, H.: Univ. Calif. Pub. Agr. Sc., 3: 103–130, 1918.

[5] COPEMAN, P. R., v.d. R.: Union S. Afr., Dept. Agr. Sc. Bul., 30, 1924, and 60, 1927.

[6] COPEMAN, P. R. v.d. R., and FRATER, G.: Union S. Afr. Dept. Agr. Sc. Bul., 50, 1926.

[7] HARGREAVES, W. A.: S. Aust. Dept. Chem. Bul., 3, 1916.

[8] HESSLER, L. E. and GORTNER, R. A.: *J. Biol. Chem.*, 119: 193–200, 1937.

[9] Methods of Analysis of the Association of Official Agricultural Chemists, 5th ed., 1940, Association of Official Agricultural Chemists, Washington D.C.

[10] RABUK, F. and SHRADER, J. H.: U.S. Dept. Agr. Bul., 952, 1921.

[11] Russian Patent 45, 286. 31 Dec., 1935.

[12] SAKAGUCHI, K., INONE, T. and TADA, S.: *Zentr. Bakt. Parasit.* Abt. 2, 100: 302–307, 1939.

[13] SERENI, D.: *Hadar*, 6: 65–67, 1933.

[14] SHAFFER, P. A. and HARTMANN, A. F.: *J. Biol. Chem.*, 45: 365–375, 1921–22.

[15] SUMIKI, Y.: *Bul. Agr. Chem. Soc. Japan*, 5: 10–13, 1929.

[16] VARADARAJA IYENGAR, A. V.: *Cur. Sc.*, 6: 610, 1937–38.

"THERE is a little doubt that there has been a definite increase in the prevalence of lice infestation, and to a lesser extent, in ked infestation," points out the Acting District Veterinary Officer, Armidale, in his annual report for 1942-43. Though a smaller number of properties came under control, this was largely due to the fact that inspectors, for the most part, were busily engaged on stock dispersal organisation when last season's shearing was being carried out—the time when most inspections are undertaken for evidence of lice and ked. This temporary relaxation of inspectors' normal activities was no doubt responsible in some considerable degree for the present prevalence of external parasitism, particularly lice, and it will be necessary to implement action during the coming year to rectify the position.

POULTRY NOTES.

December, 1943.

E. HADLINGTON, Poultry Expert.

Better Planning of Farms.

IN view of the fact that numerous enquiries are being received from people wishing to take up poultry farming—including ex-servicemen and those still in the Forces—the question of improvement in the planning of farms is one which should be given more consideration.

The position at the present time is that very few good, stocked poultry farms are for sale, and thus it is difficult for anyone to acquire a satisfactory going concern. In any case the cost of a really good farm would be as great as the building and stocking of a new farm, and there is a decided advantage in starting out on new land which has not been contaminated as the result of being stocked for many years. Again the new farm can be laid out and built to a definite plan which provides for the saving of labour as well as the welfare of the stock.

While there has been an improvement in the design of poultry farms in recent years, many folk still start out without laying down a definite plan of operations, and consequently buildings and runs are erected in the wrong positions, thus necessitating more labour in management, while in many cases pens for young stock are not kept separate from those for the adult birds.

It should be realised that a well laid out poultry farm with reasonably substantial buildings, always has a far greater value than one built haphazardly, even with the same type of buildings.

Cost of Establishing a Farm.

Many people who contemplate taking up poultry farming imagine that a farm can be bought or built with a limited capital outlay. However, the time has arrived when poultry farming should be looked upon as a business proposition, and should show sufficient returns to provide decent buildings and equipment. As long as the industry is looked upon as a poor man's business it will never advance as it should.

What happens in many instances is that a poorly equipped or otherwise unsound going concern is purchased, the price being the deciding factor rather than suitability, and all available capital is invested in the farm, leaving the purchaser without a reserve with which to effect essential improvements or tide over the lean period of the year. The result is failure and the farm is again sold, probably at a loss. Such happenings are largely responsible for the

impression that poultry farming is not a payable proposition.

While it is difficult to lay down any definite estimate which would cover all cases, it will be found that under present conditions the cost of establishing a one-man farm of 1,000 layers, including the erection of necessary buildings, the purchase of chickens for stocking the farm and raising them to productive age, will work out at approximately £1 per layer. This, however, does not provide for the land, a dwelling, or living expenses while working up. Thus allowing for the cost of the land at, say, £50 per acre, the erection of a dwelling at the maximum cost laid down by the Department of War Organisation of Industry (£400) and living expenses for one year, the total cost of a farm carrying 1,000 layers would, in the case of those starting with day-old pullets, work out at approximately £1,750. The cost may appear high, but it is little more than the value of a good suburban home, and the farm provides a home and a living. In normal times, of course, the cost would be somewhat less.

This estimate, of course, applies to the case where a living is to be made from the farm within a year or so, but where a farm can be established gradually, extending operations over several years while earning an income for living expenses independently of the farm, the returns from the flock would contribute to the cost of buildings, etc. This method has the advantage of the beginner gaining experience while the flock is being increased.

Selecting a Site for a Farm.

Many beginners make the mistake of purchasing a property for a poultry farm without ascertaining the main essentials for a suitable farm, and the result is that they often start off with a handicap. While it cannot be denied that there are some successful farms established on sites which are most unsuitable, it is far more satisfactory for general management, the health of the flock, and production, to choose an area which is close to the ideal. Some of the factors to be avoided are low-lying, badly-drained positions, or, on the other hand, those which are too exposed to cold winds or overshadowed in the winter time by high trees or hills close to the boundary.

The ideal is elevated land with a gradual slope towards the east or north, the slope being sufficient for good drainage, yet not too steep to render the erection of buildings difficult.

It is advisable to select land where city water is available or there is a permanent supply from other sources, rather than purchase cheaper land without such facilities, as the provision of a water supply would increase the cost of the farm very considerably. This will be understood when it is realised that at least 50,000 gallons of water per year would be required to provide for drinking purposes and growing of green feed on a farm carrying 1,000 layers.

Soil of a sandy nature is the most suitable, but such land is not available in many districts, and the alternative is well-drained land with a depth of 9 to 12 inches of loamy soil. Land with clay near the surface should be avoided, as it becomes very sticky in wet weather.

Suitable areas for poultry farming can be found in most districts, but some of the main factors to be considered when choosing a locality are accessibility for obtaining supplies and marketing products, and the suitability of the water supply. In addition, it is a decided advantage to have electric current available.

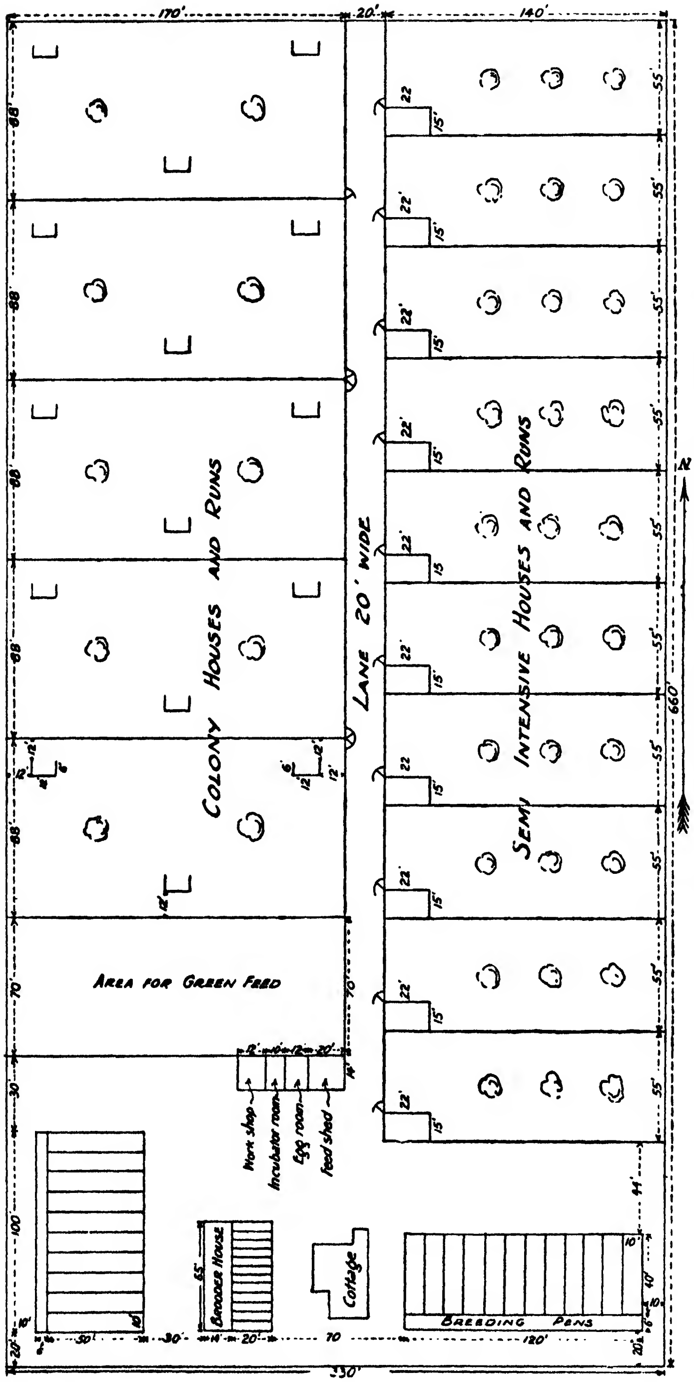
Plan the Lay-out.

In commencing to build a poultry farm a plan should first be prepared of the complete layout of all pens required for the proposed operations and providing for any future extensions. This should be done whether the farm is to be built up gradually or in a year or so.

One of the main principles when planning a farm is to have the pens for young stock entirely separated from those of the adult birds and on higher ground if possible in order to avoid drainage from the adult pens contaminating ground occupied by the young birds.

It is advisable to have a laneway about 20 feet wide between the pens for young and old stock, and to have the incubator room and brooder house reasonably close to the dwelling, in order to facilitate attention, particularly at night.

Consideration should be given to the direction which the buildings should face, and all open-fronted sheds, either for young stock or adults, should face the north or as near north as possible owing to the fact



Plan of a 5-acre Poultry Farm to Accommodate 1,500 Layers.

that less wind and rain come from that quarter and more sunlight will enter the buildings during the winter. Buildings such as brooder houses and weaning pens may face any direction from east to north, but between east to north-east is preferred, as the building provides protection from westerly winds. In both cases the runs should be erected in front of the buildings, rather than the back, so that the birds have the protection of the houses from cold winds.

Size of Runs.

One of the most common mistakes made by poultry farmers in the building of a farm, is to erect small runs for growing stock and adult birds. It is of the utmost importance to have large runs for young stock from the time they are three months old until they are fully grown. The minimum area to maintain the runs in good condition and free from contamination is about 100 square feet per bird. Even for the adult birds the larger the runs the better; the only restrictions on size are those imposed by a limited area of land, expense, and labour for working the farm, but there is no doubt that if flocks were given larger runs they would be more healthy.

An unsatisfactory system of housing layers which is adopted on many poultry farms as a means of saving labour consists of long sheds with narrow runs to each compartment, the runs mostly being about 20 feet wide. The objection to this type of housing is that the birds congregate in front of the houses—and a large number concentrated on a small area of ground is conducive to the spread of disease should there be an outbreak.

A far more suitable method is to erect single or double houses with runs not less than 50 feet wide, and long enough to provide an area of about 60 square feet per bird.

The accompanying plan of the layout of a five-acre farm shows the size of pens desirable for the different types of stock.

Use of Disinfectants in Washing Machines.

FOLLOWING upon the results obtained by using sodium hypochlorite disinfectant in the trays of washing machines in preliminary experiments carried out last year by the Council for Scientific and Industrial Research and Egg Producers' Council, further investigations have been undertaken this season with stronger concentrations of this disinfectant than were used previously.

The experiments will be completed early in the New Year and the details of the results will then be published.

Keeping Eggs Clean.

Whether the experiments prove effective in controlling rots in eggs cleaned on machines or not, there is no escape from the fact that it is preferable to keep clean as many eggs as possible and thus avoid washing them because, apart from any deterioration in quality, there is always the likelihood of breakages; it must be realised that every time any large numbers of eggs are handled some will be cracked or broken, and the total mounts up to a considerable loss throughout the year.

One of the main factors in preventing the soiling of eggs is the condition of the nests, and if a practice were made of using shell grit or coarse sand in the bottom of the nests with a layer of rice hulls on top as outlined in a leaflet on "Maintenance of Egg Quality" available from the Department, the number of dirty eggs would be reduced considerably.

In this connection it may be of interest that one of our best known large commercial poultry farmers is carrying out a test this season by making a regular practice each week of adding fresh rice hulls to the nests, and instead of cleaning the eggs on a washing machine, as in the past, having the dirty ones only cleaned by hand. To date there has been a considerable reduction in the number of dirty eggs, and the hand cleaning of these, mainly by wiping with a clean cloth, takes no longer than the machine when the time involved in keeping the machine in a sanitary condition is taken into consideration.

The fact that the Egg Board has relaxed somewhat the standard of cleanliness for eggs sold on the local market should encourage more poultry farmers to wash only the dirty eggs, either by machine or hand, instead of running both dirty and clean over the machine.

. . . INDEX . . .

TO VOL. LIV.
(1943.)

SUBJECT INDEX.

A

B

C

L

M

T

AUTHOR INDEX.

B

C

D

E

F

G

Sydney: Alfred Henry Pettifer, Acting Government Printer—1944.